

## ARCHIVES OF OTOTOLOGY.

## ON MÉNIÈRE'S DISEASE.

BY GUSTAV BRUNNER, OF ZÜRICH.

Translated by Dr. J. H. SHORTER.

IN the following article I take the liberty of reporting a case which was under my observation for thirteen years, and which I will describe as one of *Morbus Ménière sympatheticus*, or *vaso-motorius*, with some remarks thereon.

An educated young man, of twenty-eight, a manufacturer, who, with the exception of a chronic pharyngeal catarrh, had always been healthy, and, according to his recollection, had never suffered from any ear trouble or from dizziness, had a sudden attack of vertigo, with a hissing, sizzling noise in the ear on awakening one morning; this was accompanied with nausea and vomiting when he attempted to rise. The vertigo continued for two days, though constantly getting less, and then disappeared completely, only a sizzling noise remaining.

Eight weeks after, a second attack occurred exactly in the same manner, excepting that the patient already felt a slight dizziness the day before. The intermissions became constantly shorter, the third attack occurring six weeks, the fourth four, and the fifth two weeks after the preceding one. I will here remark that after the second attack, quinine in doses of half a gramme was ordered by the family physician. By taking two or three such doses as soon as he perceived the first prodroma of dizziness, the patient succeeded in cutting short the attack each time—that is to say, from that time on there was never a complete outbreak.

After the fifth, the attacks became more infrequent, the intervals longer, and in the ratio of their duration there was the same series as at first, only reversed. Later, there was no repetition of the attacks, but in place of them there appeared a kind of persistent dizziness, with a continual sizzling in both ears, especially the left. Both of these symptoms were aggravated by bad weather,

bodily exertion, or the use of alcohol. In walking, the patient felt himself drawn towards the left, the side of the worse ear ; and he often observed in connection with this a slight unsteadiness. This tendency towards dizziness, however, only showed itself in connection with motion, such as a sudden movement of the head, or rising from a recumbent or sitting position. On the other hand, the patient could stand on the parapet of a high tower or on the edge of a precipice without feeling dizzy, so long as he did not move, or on the bank of a rapidly flowing river.

On a sea-voyage, of short duration, he escaped sea-sickness as long as he remained quiet on his back, but on getting up and walking the dizziness and nausea came on.

There was likewise an absence of that peculiar sense of dizziness so frequent in anæmic and in nervous persons ; and I think that this point may be of use to us in diagnosis in cases of anæmia where at same time there is ear trouble.

A very interesting symptom which the patient had repeatedly observed in the course of these years was a transient *hemianæsthesia acustica*, which appeared always on one side, sometimes the right, sometimes the left, but without any connection with the attacks of vertigo, being produced generally by anger or worry, though sometimes occurring without known cause. This condition generally lasted a few days and then disappeared completely ; it was always ushered in by tinnitus, and was accompanied by a one-sided deafness, so that on feeling the cheek or ear of the affected side the patient did not perceive the usual noises, and with the other ear closed could hear voices only faintly, if at all. It seemed to him also that at such times this ear was less sensitive when pinched than was the other, though on this point he was not certain.

I have had the opportunity of seeing the patient repeatedly during the last thirteen years, the first time in January, 1873, four months after the first attack of vertigo. The drum membranes at that time showed nothing out of the usual, excepting slight opacity ; the tubes were considerably narrowed. Hearing for watch, Right,  $\frac{300}{400}$  cm ; left,  $\frac{30}{40}$  ; no impairment of hearing for ordinary conversation, and the patient does not notice that the hearing power has perceptibly diminished through the attacks. Tuning-fork C<sup>1</sup> was heard through the skull by the right (the better) ear.

Eight years later, in May, 1881, I again had the opportunity of examining patient, more thoroughly than the first time. There

had been no more special attacks of vertigo,—only a general tendency to slight dizziness and the tinnitus had remained ; hearing had, however, decidedly decreased even on the right side, but according to statements of the patient, not as a direct result of nor directly following the attacks, but more in consequence of a cold, with naso-pharyngeal catarrh and an uncomfortable pressure in the ears, contracted whilst hunting in the winter of 1878. The result of examination showed clearly, however, some fault in the perception, and not alone in the conduction ; for (1) *Rinne's experiment gave positive results on both sides*—Right, A. C. + 35 seconds ; left, A. C. + 45 for Tf. e (prismat. C<sup>1</sup> with clamps) ; for contra-C, right and left, A. C. + 30. (2) *Deep tones were heard better than the high ones on both sides* (Contra-C, for example, only 30 seconds, a less time than by myself). (3) *For the uppermost regions*—above the middle of the third octave—*there was, on both sides, complete deafness for tones* ; so that while the patient perceived the friction-noise of the piano keys very well, he could perceive no tone, and the limit of perception of the right (the better ear) reached from a half to an entire note higher than that of the left (with the right ear G sharp<sup>3</sup>, with the left only to G natural<sup>1</sup>). For all higher notes the patient was entirely deaf ; the shrill loud tone of the F sharp<sup>4</sup> tuning-fork of Lucae was heard neither by bone nor by aerial conduction, and the sharp, high tone of a locomotive whistle passed his ears without being perceived.

The voice-perception for ordinary conversation was not seriously impaired. Conversation in ordinary tones was heard with the right ear at 5 metres, with the left at 3 metres ; whisper—with the right,  $\frac{1}{2}$  to 1 metre ; left,  $\frac{1}{10}$  metre. On the other hand, the hearing power for the watch had decreased to 1 cm for the right ear and to 0 for the left.

I had the patient come to me again last week (November, 1886). The examination with the watch, voice, and tuning-fork gave exactly the same results as five years ago.

The hearing and the condition of the patient had not become worse, and the limit of the upper notes had also remained the same. There had been no return of the attacks of vertigo, but there remained a constant sizzling, especially in the left ear, and a tendency to dizziness ; and he felt an unsteadiness in walking, especially when in the dark, because then the impaired sense of equilibrium could receive no aid from that of sight.

Before considering the case reported, I would make some general observations.

Although Ménière characterized the disease which goes by his name<sup>1</sup> as attacks which came on *without known cause*, separated by intermissions, with dizziness, without fever, attended by subjective noises and more or less impaired hearing, it has become more and more the custom to describe every vertigo proceeding from the ears, with nausea, vomiting, etc., as a complexus of Ménière symptoms.

In this way it becomes clear that the latter can be caused:

1st. By influences from the middle ear.

2d. By disease of the labyrinth.

3d. By disease of the brain.

*The first category* we must consider more fully. It is certainly undeniable that dizziness may arise not only from the middle ear, but also from the auditory canal (by syringing, by inflation, etc.). But such causes of dizziness are easily distinguishable, by their clinical character as well as by their causative factor, from the spontaneous "Vertigo Ménière," and should not be put under this heading. When, on the other hand, there arises, in the course of a middle-ear inflammation, a typical attack of "Vertigo Ménière," the most probable causation, according to my opinion, is to be found in a pathological condition of the labyrinth—of the semi-circular canals; for even when the latter stands in causative relationship to the middle-ear affection, it still can rightly be regarded as an independent disease, just as is the case with an otitis media, which may have come from an affection of the nose or pharynx.

Therefore there still remain in explanation of Vertigo Ménière only the labyrinth, the acoustic nerve with its centres, and to these I would add the sympathetic.

In every sensation of dizziness, the cerebrum, as well as the cerebellum, is implicated: the former as the known organ of perception; the latter as that organ the abnormal excitation or the impairment of function of which demonstrates itself centripetally as sensations of vertigo, centrifugally, on the other hand, in the involuntary arbitrary muscular movements which accompany the

<sup>1</sup> It would be more correct to call the disease Vertigo Ménière (V. M.), since the name does not convey a definite idea of the disease.



vertigo. Abnormal excitation of the cerebellum can be produced by diseases (or impairment of circulation) which have their seat in the organ itself, or by abnormal peripheral influence upon those nerves which end in or traverse its substance, and which in their normal action furnish us proper appreciation of space.<sup>1</sup>

Also in the so-called psychical vertigo, which is to be regarded as a product of imagination in the cerebrum; the coöperation of the cerebellum is also necessary (according to Nothnagel) for the production of the real sensation of dizziness.

That vertigo Ménière can be produced by *pathological processes in the brain, especially in the cerebellum*, admits of no doubt. There are at present no certain indications for differentiation; still only in rare cases (as, for example, the very interesting one observed by Wolf<sup>2</sup>) could this be confounded with pathological conditions in the labyrinth, *if we decide that to Vertigo Ménière belong not only attacks of dizziness, but also undoubted impairment of hearing, which latter is only exceptionally present in lesions of the cerebellum.*<sup>3</sup>

*As characteristic of cerebellar trouble we have (according to Nothnagel) only the disturbances of coördination, for example, tremulous gait and severe dizziness; (although these are not really pathognomonic, being present also in other diseases of the central nervous system). All other appearances, such as impairment of sight, occipital headache, dis-*

<sup>1</sup> Compare, Nothnagel, Vertigo, in Ziemssen's "Handbuch der spec. Path.," Bd. xii., 2. S. 329.

<sup>2</sup> *Zeitschrift für Ohrenheilk.*, vol. viii., p. 380.: Tumor (gumma) of the tonsil of the cerebellum, which gave rise to the Ménière group of symptoms continuously for two years, viz., attacks of vertigo, with subjective noises and limitation in hearing, with a disturbance of certain range of tones on the left side. Cerebral symptoms only appeared at the end of two and a half years: dilated pupils, ptosis, facial paresis, and psychical disturbances.

<sup>3</sup> Nothnagel says in his "Top. Diagn. of Diseases of the Brain," p. 76: With exception of the optic, it is *exceptional* that there is disturbance of function in the nerves of special sense in affections of the cerebellum. Several times there have been changes in hearing (hallucinations or deafness), a plausible cause for which might be found in compression of the trunk of the acoustic nerve, or an accidental aural complication. This frequent implication of the optic nerve, in contrast with the very exceptional involvement of the acoustic, is certainly very remarkable at first glance, though according to Nothnagel the disturbance of vision does not depend directly on the cerebellum, but is simply a sequence of the general increase of intracranial pressure. In the case of Wolf's already mentioned, the disturbances of hearing could without doubt likewise be referred to pressure (more accidental) upon the fibres of the acoustic nerve.

turbances of various motor nerves, etc., owe their development only to accidentally complicating conditions.

Nothnagel (*l. c.*, p. 64) says : The clinical picture of the vertigo itself in affection of the cerebellum possesses nothing particularly characteristic. An unusual severity and an almost continuous occurrence would be more likely to awaken suspicion of an anatomical cerebellar lesion. But it must not be forgotten that an equally severe vertigo may appear in Ménière's disease and even in cases of gastric vertigo. However, in such cases there are always other additional symptoms pointing to the condition which may be present.

Although it is in the cerebellum, in its middle lobe<sup>1</sup> (the so-called vermiform process), that the centre for coördination and equilibrium is to be sought for, still *according to all pathological experiences, it is very seldom that the Ménière group of symptoms results from cerebellar lesions*; and even when it does, it is not produced directly by the latter themselves, but much more by the accompanying accidental compression of the acoustic nerve fibres. The same observation applies equally to those parts of the cerebrum, which are in relation here, as, for example, the crura-cerebelli, lesions in which are known to produce forced movements of the trunk, head, and eyeballs, with vertigo and an inclination to fall to one side.

Accordingly the most frequent causes of Ménière's vertigo are to be looked for more peripherically and especially in the labyrinth.

To what extent the acoustic nerve in its course from the central organ to the labyrinth is to be considered, cannot now be stated. And if to this must be added the possibility that Ménière's attacks may be produced, for example, by a tumor pressing on the acoustic nerve, the clinical picture will in most cases differ, also the accompanying disturbance of hearing—independent of a possible implication of the facial.

Unfortunately here we enter upon an obscure subject, and without any prospect of an early clearing-up. Therefore

<sup>1</sup> It is known that an entire cerebellar hemisphere may be lacking, that is, destroyed by disease, without any recognizable pathological symptoms; these latter, especially the disturbances of coördination, are only found where directly or indirectly (for example, by pressure) the middle lobe is implicated.

we must endeavor to get nearer the subject clinically by the most careful comparison of pathological pictures. We know that V. M. may be produced by many diverse conditions in the labyrinth: All acute injuries and inflammations of the labyrinth are, in the beginning, accompanied by dizziness, and there is no doubt but that any hemorrhage in the labyrinth may occasion severe vertigo; likewise chronic inflammatory, or degenerative conditions through congestion, exudation, or hemorrhage; also vaso-motor neuroses. Finally, whether there are pure neuroses of the acoustic nerve which could cause V. M., I leave undecided; the hysterical anæsthesiæ of the acoustic run their course, so far as I know, without vertigo.

*Is it not possible to distinguish definitely and exactly between these individual clinical pictures?* Should we not, for example, first of all, distinguish the *benign* and, so far as functional disturbance is concerned, *mild cases* from the *severe* ones in which the attack is accompanied by sudden or quickly appearing deafness or hardness of hearing? Vaso-motor neurosis undoubtedly behaves differently from repeated hemorrhages. And then also the question presents itself whether certain forms of Ménière's disease are not related to the glaucomatous affections of the eye.

That the symptoms of dizziness are only caused in the semicircular canal by a condition of irritation, whilst persistent destructive diseases do not cause it, has often been pointed out and is clearly illustrated by an interesting observation of Moos<sup>1</sup> in which after the falling out of a necrosed semicircular canal deafness appeared and with it permanent cessation of the severe dizziness.

The following observation of Schwartze<sup>2</sup> is of interest in a diagnostic point of view: "A man of 43, with atheroma of the arteries of the head, suddenly became totally deaf for voice; this was accompanied by symptoms of labyrinthine hemorrhages; all symptoms disappeared after two weeks, but returned ten times in the next two years, always in the same way. The supposition that it was dependent upon extravasation of blood seemed probable on

<sup>1</sup> These ARCHIVES, xii., p. 132.

<sup>2</sup> "Chirurg. Krankheiten des Ohres," p. 370.

account of the simultaneous appearance of vitreous and of retinal hemorrhages, with sudden blindness of the right eye." I cannot share this opinion. An effusion of blood would have to be quite considerable in order to cause complete deafness; and I cannot believe that such an accident could be repeated ten times without leaving a disturbance of function. Was it not perhaps a vaso-motor neurosis of the labyrinthine vessels and an extravasation as a result of this? Unfortunately we have still very little information as to the symptoms and causes of labyrinthine hemorrhages.

Confounding Ménière's disease with acute inflammations of the labyrinth could only occur at the beginning, and then only if, like *Gottstein* and others, we speak of any severe vertigo with vomiting, hardness of hearing, and tinnitus as a complexus of Ménière's symptoms, without regard as to whether the dizziness appeared suddenly in attacks, whether intermitted or constant, or whether accompanied by fever or not—a habit which hardly is conducive to progress in the matter.

I would like also to inquire whether such cases as the celebrated one of Charcot concerning a Mme. Giraud, should not be arranged into a special group. This woman suffered from childhood with bilateral otorrhœa, with a deficient drum-membrane, purulent and occasional bloody discharge and granulations in the left ear. Apparently it was a case of secondary, deep-seated trouble of the labyrinth—of the semicircular canals with a suspicion of caries. Although the patient (51 years old) had suffered in former years from pronounced Ménière's attacks, with intervals of freedom from dizziness, yet later, the severe vertigo became so permanent that she was confined to bed for six years; walking or standing was now out of the question, every slight movement, even the approach of a stranger toward the bed, causing intense vertigo. With this there occurred from time to time attacks of vertigo accompanied by a feeling as if the body were turning over forward or backward, and initiated by a subjective impression of shrill whistling—this Charcot regards as of special diagnostic importance. I have briefly mentioned this exquisite case, as it is spe-

cially interesting from its successful treatment with quinine, to which I will revert.

After these general remarks let us return to the subject of my observations.

I should prefer to have this regarded as a neurosis (perhaps a vaso-motor neurosis of the blood-vessels of the labyrinth). In favor of neurosis are the certain degree of regularity in the intermissions,<sup>1</sup> especially the "aura vertiginoso" preceding the attacks, the prompt and unfailing effects of quinine (which, it may be remarked, excludes the theory of repeated hemorrhages), and the hemianæsthesia acustica which occasionally appears especially after excitement.

In favor of the supposition that the exciting cause of the vertigo has its origin in the labyrinth may be mentioned, besides other reasons, the fact that the capacity for the upper tones is diminished. That this commenced with the loss of a half or an entire note sooner in the ear first affected than in the other, seems to me also as of interest and not entirely accidental. If we accept increased labyrinthine pressure as the cause of the defect—and numerous experimental<sup>2</sup> and clinical<sup>3</sup> experiences point to this,—it is entirely natural that the injurious results should be present to a greater degree in the ear first and more severely diseased.

In this connection a series of questions present themselves. *Shall we not assume, that the pressure in the labyrinth behaves similarly to that within the cranium, where the very considerable fluctuation in pressure, caused by the blood current rushing by fits and starts into an unyielding skull, entails no damage whatsoever, even by excessive increase of the heart's action, so long as the yielding channels of the circulation—the subdural and the subarachnoidal spaces, namely, of the lymph sheaths of the afferent and efferent vessels and of the nerves—remain intact?*

I, at least, do not doubt but that a similar condition may be of the greatest importance in labyrinth pressure, and

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<sup>1</sup> I will here remark that the patient has never suffered from malaria, and lived in Zurich, a region entirely free from it.

<sup>2</sup> Burnett: *Zeitschrift f. Ohrenheilk.*, Bd. ii., p. 264.

<sup>3</sup> Moos: *Zeitschrift f. Ohrenheilk.*, Bd. x., p. i.



that a narrowing or obliteration of the circulatory channels may produce a special disposition to Ménière's disease.

This also leads to a certain analogy which many forms of Ménière's disease have to glaucomatous affections of the eye.

Unfortunately we are very poorly informed as to the physiological mechanism of the labyrinth, not to speak of the pathological. For the perilymph, which receives the pressure of the stapes most directly, there are, besides foramina for blood-vessels, two yielding channels, the round window (especially for acoustic vibrations), and the aqueductus cochlearis leading to both great lymph spaces of the brain, which is more designed for relief of pathological variations of pressure.

The endolymph, on the contrary, possesses a much more restricted capability of escape, since the membranous aqueductus vestibuli ends in the saccus endolymphaticus, which is completely closed in between two layers of the dura-mater; it is still undecided whether there exists a communication between the endolymph and the subarachnoidal space through the sheaths of the nerves and vessels. Up to the present time, at least, injections of the acoustic-nerve sheath in man have not penetrated farther than the bony plate found in the depth of the internal auditory meatus.<sup>1</sup> The capability of yielding which the endolymph possesses is at best only the possible pushing aside of the saccus, or better, the sacculus endolymphaticus, at the posterior surface of the temporal bone.

Whether in the above-mentioned case there is a question of neuroparalytic or neuroplastic condition, I am undecided, and the more so since a like question still remains far from being cleared up in cases of migraine, as well as in the very analogous condition (the so-called flitting scotoma).

Supplementing this, I find a case corresponding in its chief points to my own, reported by Politzer (in his text-book, p. 832), which he regarded as a neurosis of the sympathetic and placed under the title of "Angioneurotic Paresis of the Acoustic Nerve." The treatment consisted in galvanization of the cervical sympathetic. The attacks became less frequent, and after several months completely disappeared. The hearing reached its

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<sup>1</sup> Compare Schwalbe, "Anatomie der Sinnesorgane," 1886, pp. 400 and 406.

former height after cessation of the attacks, but it is not mentioned whether it suffered eventually or not.

If we assume that in our case, for example, an overfilling of the blood-vessels of the labyrinth caused the attack of vertigo, an explanation of the favorable effects of quinine is found in the extremely interesting experiments made by Hans Brunner under direction of Prof. Horner, given in the dissertation "On Quinine Amaurosis."<sup>1</sup> In this it appears that large doses of quinine *constantly cause a high degree of ischæmia of the retinal vessels*, not through spasmodic contraction of the arteries, but by the paralytic influence which quinine in large doses exerts on the heart. Since in this way the general blood pressure is lowered, less blood comes into the arteries, and these must adapt themselves to the smaller blood column by narrowing of their lumen.

Since the opinion has obtained a firm hold upon aurists, owing to the investigations of Kirchner<sup>2</sup> and of Roosa, and in spite of the protests of Knapp<sup>3</sup> that quinine in large doses causes hyperæmia of the vessels of the external, middle, and internal ear, even increasing to the point of extravasation, an opinion which, from all we know of the effects of large doses of quinine and from experience with the eye, is untenable, it seems quite in place here briefly to mention this work, especially since the majority of colleagues are probably unfamiliar with it.

In reading Brunner's work we easily perceive that Kirchner could or must have come to another conclusion. According to Brunner, the first striking symptom which appeared was a severe dyspnœa—that is, in small animals, such as rabbits and cats, on which Brunner experimented chiefly; and the regular termination was a picture of epileptiform convulsions, frequently of such intensity that the animal threw itself from the table on to the floor, with opisthotonos, etc. Most of the animals died in the frequently repeated attacks, and the autopsy showed the large cranial veins as well as the right side of the heart to be filled to distension with dark blood. The ophthalmoscopic examination of the cats and rabbits gave no constant results; *this was first*

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<sup>1</sup> Diessenhofen, 1882, 69 pp. Well worth reading.

<sup>2</sup> *Berliner klin. Wochenschrift*, 1881, No. 49.

<sup>3</sup> *Zeitschrift f. Ohrenheilk.*, Bd. x., p. 279.

*obtained by Brunner in cases of dogs that had previously been put into a condition of chronic cinchonism.*

In these cases, examination during life *constantly showed a high degree of ischæmia of the retinal vessels—of the arteries and of the veins.* The arteries were hardly visible, the veins very slightly filled, and the slightest pressure of the finger upon the globe, or even the simple stroke of the lid, was sufficient to make all the vessels of the papilla completely bloodless for the moment, so that the disc seemed entirely white. Numerous observations made on man by Knapp, Michel, Gruening, Horner, and others coincide with these.

Horner had occasion to examine a lady who, in consequence of large doses of quinine, had been completely blind for four days. After a period of more than a year the visual power, with the exception of a concentric contraction of the visual field and a diminution of color-perception, had entirely re-established itself. Horner found both optic nerves *chalky white, and all the vessels very narrow*; at the left optic nerve there was a *thrombus* of the superior nasal artery and great pallor and thickening of the walls of the nasal and of the inferior temporal. *The superior nasal artery was a perfectly white cord, which could only be followed a slight distance.*

The examinations of inflamed parts of frog's tongues by Dr. Appert gave a like experience with my experiences upon the eye. He found that after subcutaneous employment of quinine, the circulation of the blood became slower, and the afferent arteries became narrowed in proportion to the size of the dose of quinine. He is inclined to attribute the antiphlogistic effect of quinine in part to these changes in the circulation.

It is known that quinine in large doses is a cardiac poison; that it exercises a paralyzing effect on the intra-cardiac nerve centres, whereby the contractions of the heart become slower, and at same time *less pronounced*. Schroff noticed an enormous reduction in the blood-pressure after large doses of quinine in animals.<sup>1</sup>

After the above, it is not easy to imagine that quinine can produce an ischæmia of the retinal vessels, and at the

<sup>1</sup> I would here take the liberty of recalling a former observation of mine, entitled "Temporary Deafness with Subjective Melodious Noises, as a Result of Large Doses of Quinine." (*Zeitschrift f. Ohrenheilk*, Bd. vii., p. 204.) The cause of the subjective sensations of hearing had to be sought for in the cerebrum, but it remained undecided whether the irritation of the brain cortex was to be regarded as a direct effect of the quinine circulating in the blood, or only as a result of the change in the blood-pressure.

same time a hyperæmia in those of the labyrinth; and the results of Kirchner are explained by the dyspnœa and epileptiform attacks, which regularly appear in small animals.

We might imagine that quinine taken at the beginning of an attack would, by diminishing the blood-pressure in the labyrinth, check the threatened engorgement.

The ischæmia of the retinal vessels can lead to their permanent obliteration, as is shown by Horner's observations; the collapsed vascular walls, being deprived of contact with normal blood, degenerate rapidly, and an adhesion of opposite endothelium takes place. Prof. Horner is inclined to assume an endovasculitis ex ischæmia, ex vacuo.

As is known, Charcot is accustomed to order quinine in large and continuous doses in V. M. The above-mentioned Madame Giraud, for instance, took a daily dose of 0.50 to 1.00 grammes for almost three months; and the result was a very favorable one. After five weeks the continuous dizziness had diminished in intensity, and later it ceased entirely, as did also the whistling noise; and at the end of three months the patient could again stand and walk for the first time in six years. The deafness was neither greater nor less than before.

I would ask the question whether in this and similar cases<sup>1</sup> the favorable results of the quinine may not be explained by an obliteration of the labyrinthine vessels by ischæmia and consecutive atrophy whereby the vertigo-producing factor in the semicircular canals is removed. We certainly know that it is much more a condition of irritation in the latter, and not one of atrophy or paralysis, which provokes the dizziness.

Charcot has expressed a similar idea, even though in indefinite form. He says, for instance ("Leçons sur les maladies d. syst. nerv.," p. 325): "I have been struck with the idea that by aid of sulphate of quinine which occasions, among other phenomena, a more or less pronounced tinnitus, we may possibly succeed, by sufficiently prolonged and large doses, in effecting lasting changes in the functions of the acoustic nerve."

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<sup>1</sup> Compare note on Ménière's disease of Féré and Demars, Paris, 1881.

*Conclusions.*

1. Since, at present, the name "Morbus Ménière" describes no special disease, but only a complexus of symptoms, it would be better to speak of *Vertigo Ménière* (V. M.).

2. Only such conditions should be classified under the head of V. M., in which the attacks of dizziness occur suddenly, without known cause, with distinct intermissions, which are ordinarily quite lengthy, without fever, with more or less intense subjective noises ushering in the attack, and with a rapid or only gradually occurring deafness.<sup>1</sup> This excludes the dizziness in mechanical interference with the middle ear, as well as the constant dizziness of acute labyrinthine inflammation.

3. That V. M. can be caused by pathological processes in the brain (especially in the cerebellum), cannot be doubted; there are no absolutely certain signs for differential diagnosis; still a confounding of the two will occur very seldom, since disturbances of hearing are only exceptionally present in lesions of the cerebellum (and also of the crura cerebelli), and if present they are only as a result of accidental pressure upon some of the adjacent fibres of the acoustic nerve.

4. Ordinarily V. M. has its origin in some pathological condition of the labyrinth (semicircular canals), primary or secondary.

5. In the interest of the nosological arrangement of V. M., the separation of the severe cases—those with sudden or rapidly acquired deafness—from the mild ones seems indicated, since the two seem dependent upon different anatomico-pathological bases. On the same ground, the V. M. following an otorrhœa of many years' standing, could be described separately as "V. M. post otorrhœam."

6. Some cases of the *severe* form may be dependent upon hemorrhage into the labyrinth; some of the *mild* forms, to vaso-motor neurosis.

7. However, I believe that too much stress is laid on the

<sup>1</sup> Up to the present time, it has been assumed that permanent impairment of function belonged to V. M.; whether there are cases of vaso-motor or of a neurotic nature in which (as in the above-mentioned instance of Politzer) the function of hearing remains intact, can only be learned by further observations.



part which hemorrhage plays in explaining the *V. M.*, and I would express my opinion that a large number of cases depend upon a pathological condition of blood-pressure in the labyrinth (analogous to glaucoma), *and that a retarding or stopping of the efferent channels for the perilymph and the endolymph is a very important factor in this affection.*

8. In favor of a vaso-motor (neurotic) origin of *V. M.*, there seems to me to be (*a*) the "aura vertiginosa" preceding the attack; (*b*) slight (even absent) functional disturbance appearing only gradually; (*c*) a certain regularity and frequency of the attacks; (*d*) the effect of quinine in cutting short or at least moderating the attacks (also galvanization of the cervical sympathetic).

9. From the experience of ophthalmologists, as well as from all we know as to the action of large doses of quinine, there is no doubt but that they produce a high degree of ischæmia of the retina as well as of the labyrinth. In this way may be explained the favorable influence of large doses of quinine in my own and in similar observations, as well as in the Giraud case (Charcot's).

#### SUPPLEMENT.

I notice subsequently that Professor Moos, in his monograph on "Cerebro-Spinal Meningitis," (p. 45 and f.), goes extensively into the Charcot quinine treatment. He regards it as probable that the quinine treatment—the many favorable results of which he does not question, he having even observed it himself in one case—allays the dizziness through the antiphlogistic qualities of the quinine, and not through destruction of the functions of the acoustic nerve. The fact that the disturbances of motion cease with the occurrence of total deafness, he regards as very exceptional. Even if this were the case, it would be questionable, according to Moos, whether a destruction of the function of the acoustic nerve would be justifiable—certainly not without the consent of the patient.

## A COMMUNICATION UPON THE MEDICAL DUPLEX-INDUCTORIUM.

R. WREDEN, OF ST. PETERSBURG.<sup>1</sup>

(With a wood-cut)

Translated by CHARLES H. MAY, M.D., New York.

THE object of this paper is to acquaint my colleagues with an electro-therapeutic apparatus constructed by me, with which I have had brilliant results in the treatment of aural patients. The following observations will serve to make the practical applicability and the method of construction of this new induction apparatus properly understood.

Since 1863 I have been largely engaged in electro-otological studies. These have resulted in a series of publications and in the following main results:

1. *Excitation of the acoustic nerve by the galvanic current gives the same reaction formula as with motor nerves (Pflüger's "law of contraction."), and the "normal formula of the acoustic nerve" advanced by Brenner represents but one half of the true normal formula.*

2. *Excitation of the acoustic nerve by the faradic current occurs as regularly as when produced by the galvanic current; naturally the interrupted inductive currents produce interrupted auditory sensations (rattling), whilst the constant current causes continuous auditory impressions (ringing). (As is*

<sup>1</sup> Although disagreeing with several of the theses advanced by the author in the introduction, we have gladly accepted this paper on account of its other portions.—MOOS.

known, Brenner and his followers have denied the possibility of exciting the acoustic nerve by the faradic current.)

3. *The manifestations of excitation of the ear by galvanic as well as by faradic currents are not due to direct but to INDIRECT excitation of the acoustic nerve, and are demonstrated by direct irritation of the facial nerve (the nerve to the stapedius muscle), through contraction of the stapedius muscle with following pressure-excitation of the end-apparatus of the acoustic nerve in the labyrinth. (Brenner states that his "normal formula" is produced by direct galvanic excitation of the acoustic nerve.)*

4. *Applications of the galvanic as well as the faradic current of not too great intensity to the EUSTACHIAN TUBE produce severe manifestations of excitation in the area supplied by the third branch of the trigeminus nerve and none in that of the facial nerve; whilst these same currents cause severe manifestations of excitation in the parts supplied by the facial nerve (and acoustic nerve) and none in that of the third branch of the trigeminus nerve, when the electrode is applied to the TYMPANUM. (Upon this is based the method of circumscribed electrical excitation of the tensor tympani muscle as well as of the stapedius, which can be reached with certainty by means of a tympanal catheter armed with a fine wire; the application of electrodes to the tube and to the tympanum represents the best method of circumscribed excitation of the third branch of the fifth nerve and of the facial nerve, because in this way the proximate excitation of the trunk of the nerve before it has branched, at the foramen ovale and at the Fallopian canal, becomes possible.)*

5. *The treatment of the diseased ear with the galvanic current by Brenner's method has neither diagnostic nor therapeutic value, and cannot be considered as devoid of danger.*

This last conclusion warrants a more extended discussion, because it is of the utmost importance to practising physicians.

In 1871, I demonstrated that the absence of the "normal formula" of Brenner—absence of the so-called reaction of the acoustic nerve—did not in any way justify the diagnosis of paresis of the acoustic nerve, since, as is well known, it is

observed not only in those suffering from defective hearing but also in others whose hearing is comparatively good, and in whom any suspicion of paresis of the acoustic nerve is absolutely excluded. On the other hand, it has been proven that re-occurrence of the "normal formula" in those who are hard of hearing by means of the "electrical education of the acoustic nerve" with Brenner's method is not accompanied by any improvement in hearing; finally, it is well known to every specialist that the very cases of extreme hardness of hearing with deficient drum membranes after purulent discharges are conspicuous for the ease with which they present the full reaction formula—these were then designated as cases of "hyperæsthesia of the acoustic nerve" by Brenner, whilst really this is produced, when mild currents are used, by the removal of great resistance (drum-membrane). It is impossible for the exponent of the theory of *direct* excitation of the acoustic nerve to explain this remarkable manifestation; whilst from the standpoint of an *indirect* irritation—through the facial nerve—it is easily accounted for.

The absence of galvanic auditory sensations in persons who are neither afflicted with paresis of the auditory nerve nor with that of the facial nerve is satisfactorily explained by pathological immobility of the stapes (whether this is the result of ankylosis of the oval window, of abnormal fixation by means of pseudo-membranes, etc., whether the result of atrophy, fatty degeneration, etc., of the stapedius muscle).

The restoration of the so-called "normal formula" of Brenner by methodical galvanization of the ear cannot, in itself, lay claim to any improvement in hearing, since it demonstrates nothing but an improvement in the electrical excitability of the stapedius muscle, and it is very seldom that hardness of hearing is produced solely by an interference with the function of this muscle.

After I had become convinced that the galvanic auditory sensations were not produced by *direct* irritation of the acoustic nerve, but by an *indirect* excitation of this nerve produced by contraction of the stapedius muscle, and after I had found an exact method of circumscribed electrical ex-

citation of the stapedius and tensor tympani muscles by means of tympanal and tubal electrodes, the question naturally presented itself, which current—the primary or the induced—was to be preferred in electrical treatment of the ear? At first (from 1863 to 1870), owing to the influence of Remak and of Brenner, I gave undisputed preference to the galvanic current. Since 1871, however, I have become convinced of the superiority of the faradic current for this purpose; and at present I give it a decided preference, in the modified form used by me, over the galvanic current. I no longer use the latter in the treatment of the ear, because its employment is attended with various evils which are not attendant upon the faradic current. These untoward effects depend principally upon the *electrolytic* properties and the *low tension* of the galvanic current.

To produce muscular contractions, especially in the depths of the ear, it is necessary to use an electrical current of high tension which can overcome the intervening objects of resistance; and to obtain lasting tonic muscular contractions, a rapid succession of currents of high tension is necessary. Such are produced by the induced to-and-fro currents of the various medical induction-apparatuses. The constant current of a galvanic element, on the other hand, has a very low tension and is therefore not adapted to overcome the enormous resistance of the human skin and to cause contraction of deep-seated muscles. In order to supply such a current with the necessary tension we must join many elements together in a series; then the current would be able to cause muscular contractions. The greater the resistance, that is, the deeper the muscle, the greater would be the number of elements required. For example, a series of from twenty to thirty Daniel's elements<sup>1</sup> are necessary in order to produce an opening-contraction of the stapedius muscle, whilst a single element is sufficient to produce a current by means of the induction-apparatus, which, through its high tension, is capable of throwing the muscle into the most severe tetanic spasm.

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<sup>1</sup> Parallel series (*i. e.*, zincs joined to zincs and coppers to coppers) of thirty or more elements fail to cause the slightest contraction.



A battery of thirty elements, which produces but moderately weak contractions of the stapedius muscle, possesses considerable electrolytic properties, capable of causing a chemical decomposition of the fluids of the human tissues. The separation of acids and alkalies in the living body at the kathode and anode tends to produce an inflammatory irritation in the affected tissue shown by subjective and objective symptoms of inflammation. The occurrence of perforative otitis media as a result of tympanal galvanization, and of acute myringitis and otitis externa after application of the galvanic current through the external auditory meatus, has been observed by me, occurring several times in the course of the year, and this tends considerably to discourage this method of treatment. On the other hand, similar inflammatory processes are never observed after application of the induced interrupted current because this current possesses no electrolytic properties on account of the constant change of poles. The case is different with the induction currents (continuous) used for chemical purposes (for instance, for galvano-metallurgy) and scarcely to be recommended in the treatment of the ear.

Another injurious effect upon the patient which not infrequently occurs upon application of a strong galvanic current, is the marked redness, painful swelling, and even vesication and cauterization of those parts upon which the electrode has been allowed to remain too long. Even though these serious inflammatory conditions can easily be avoided by a careful specialist, still the latter cannot prevent, even with the greatest attention, the occurrence of hyperæmia in the galvanized tissues. This can constantly be observed even after the application of comparatively weak currents, and shows itself especially in the blood-red injection of the blood-vessels of the membrana tympani after each galvanization, whether applied through the tube, the auditory canal, or the tragus. This demonstrable hyperæmia of the blood-vessels of the drum-membrane is undoubtedly but a part of a deeper, unobservable hyperæmia of the blood-vessels of the ear and brain, which must certainly be affected with the more deeply penetrating effects of a

stronger battery-current, and of which the accompanying subjective symptoms of the galvanized patient give positive proofs. Therefore, as early as 1871 I made the following assertion: "Altogether the use of the electrical (galvanic) current in all congestive ear troubles and especially in congestive affections of the labyrinth is absolutely contra-indicated." In the course of years I have received many living examples from the hands of electro-therapeutists, which have illustrated the correctness of this sentence; therefore I would direct the special attention of the latter to this circumstance: "*Primo non nocere!*"

This undesirable effect need not be feared after application of the faradic current, since this form is devoid of any electrolytic action. On the contrary, very often immediately after its application, the redness of the blood-vessels of the malleus, produced by stasis (venous hyperæmia), is seen to disappear. This is probably due to the effect of electrical irritation of the vaso-motor nerves causing contraction of the blood-vessels.

Finally, the great strength of current required on account of the low tension, if muscular contraction is to be produced, leads to the consideration of the fact that the galvanic current in general can be localized only with difficulty on the human body—certainly with more difficulty than when the interrupted induced current is used. This was already pointed out in my electro-otological treatises in 1871 and 1872, and especially emphasized in the description of tubal and tympanal galvanization of the ear.

Even with cutaneous galvanization of the ear, strong currents penetrate to neighboring organs—the eye and the brain; for flashes of light, vertigo, and oscillations of the body (always toward the side of the anode), deafness, and with long-continued and stronger galvanic excitation even nausea, vomiting, and syncope are among the accompanying manifestations of the *galvanic* aural sensations, whilst the *faradic* are never accompanied by symptoms of irritation of the optic nerve or of the brain.

If now, in addition to the undesirable effects just men-

tioned we consider that the cost and maintenance of a galvanic battery is much more expensive and requires more time than does an induction-apparatus, and besides the latter possesses the advantage of easy transportation, the reason of my preference for the induced current will be evident to every one.

The next question is: Is the use of the induced current for medical purposes unaccompanied by any evils, and may it be considered as entirely harmless?

The same property which gives the induced current its special value in therapeutics (*high tension*) gives rise to its chief evil in applications to the human body, because it causes *pain*. The higher the tension, the deeper will the current penetrate into the body, and the more will it irritate the sensory nerves, which respond with sensations of severe pain; whilst excitation of the motor nerves only causes muscular contractions. There is no *danger* connected with the use of the commonly-employed medical induction-apparatus (Du Bois-Raymond's apparatus), but there is danger in the careless employment of the larger Rumkorff coils, which present an enormous difference in potential. The degree of this difference in potential regulates the strength of the physiological effects of the current, but not the quantity. If, for instance, we touch two points of a conductor, the difference in the potential of which amounts to 100 volts, it is entirely irrelevant to the physiological effect of the current whether one ampère or one thousand ampères flow through the conductor; for the strength of the current which penetrates into the body is the quotient of the difference of potential 100 and the resistance of the body, and consequently entirely independent of the quantity of current existing in the conductor. As is well known, every induced interrupted current with an average tension of 100 volts and a maximum of 200 volts must be considered absolutely harmless. But there are machines in use for electric lighting of 1,000 to 2,000 or more volts; and Deprèz has constructed a machine of 6,000 volts for the electric transmission of power between Creil and Paris. If any one touched a conductor of such a current, even at a

single point accidentally, he would fall to the ground dead, as though struck by lightning.<sup>1</sup>

Since the painfulness of faradization is especially marked in the deeper parts of the ear, and deters many persons from making use of this method of treatment, I made many experiments in methods of application, in order to obviate this evil, but unfortunately with unsatisfactory results, until finally, through accident,<sup>2</sup> I discovered the proper remedy in secondary induction. If an induced current of high tension and of little intensity is taken up by a second conductor whose primary induction coil is formed of fine wire wound in many layers, whilst the secondary induction coil has but a few layers of thick wire, a current will be produced of much lower tension, but of greater intensity. This secondary inductor acts in the opposite way from the primary inductor, which serves to change the

<sup>1</sup> The danger which the accidental collision (by tearing, falling, etc.) between the overground electric-lighting wires and telephone and telegraph conductors might have for the officers and workmen of the latter, and which has already shown itself a number of times in St. Petersburg, led the Imperial Russian Technical Society to appoint a committee who should determine what strength of current might render the placing of a telephone to the ear dangerous to life, and what protection against this could be recommended. Under the presidency of Tarchanoff, professor of physiology at the Military Medical Academy, this commission consisting of specialists on telephone, electric-lighting, and mining, made a long series of valuable experiments on animals at the factory of Jablotschkoff & Co. in 1883. Among others, they made many trials of the protecting apparatus constructed by me as a member of the commission (called the *telephonprotector*), the result of which was entirely satisfactory. In this way an interrupted current of 200 volts, which caused the instant death of a large dog, could be applied without any injury to a guinea-pig,—which animal is known to be extremely sensitive to the electrical current. The apparatus in question is familiar to visitors of the Vienna International Electrical Exposition (1883) and of the First Russian Electrical Exhibition (1885-1886), and I mention it here only because it can be recommended to physicians as an agent for preserving human life from the risk of death through lightning and other excessively strong electrical currents.

<sup>2</sup> In the electric exposition at St. Petersburg, in 1882, there were three different phonophorstations exhibited by me, which together enabled one to compare telephoning by the induction-current and by the battery-current, and which also served to prove that the telephone inserted into the primary coil transmitted speech much louder than that connected with the line—the secondary coil. In other words, it was found that the secondary induction (induction of the second order) excited the iron rod of the telephone much more strongly than the primary induction. This occurrence I could only explain by the change of the induced line-current of high tension into a local current of less tension but of greater intensity. Since the telephone is an apparatus which is extremely sensitive for electric currents, involuntarily reminding one of the exposed sciatic nerve of the frog, I suddenly conceived the idea of utilizing the secondary induction for electro-otological practice.

low-tension current of a galvanic element into one of high tension.

The utilization of a secondary inductor in faradization is of great service, since it enables us to apply an induced current free from pain and danger, and one producing comparatively stronger muscular contractions. These valuable attributes are of great practical importance in the treatment of the ear.

But the plan of construction of my medical duplex-inductorium still lacked a second requirement of modern electro-therapeutic practice—namely, the application of *statical electricity* for therapeutic purposes, in a form which would be convenient and easy of practical application.

It is well known that of recent years statical electricity has been drawn from its forgotten position, and has found ardent supporters among celebrated specialists (Charcot, Benedikt), and, according to my experiences, justly so.

However, the utilization of statical electricity generated by the electrical machines of Holtz, Teplof, and others is very inconvenient and expensive for physicians, since an assistant is required to turn the glass plate, and the presence of this person must be embarrassing to a more or less disrobed female patient; or an electro-motor must be set up in the waiting-room, with batteries in the neighborhood, and this again is very expensive; finally, these electrical machines, no matter of what construction they may be, are known to produce very changeable, inconstant currents, and are very unreliable as regards charging and discharging. These evils induced me to substitute a Rumkorff coil attached to a Grenet battery, and giving a spark one *cm* in length. This had to serve a double purpose in my apparatus: to act either as a primary inductor in faradization, or as the producer of sparks for statical electrification of the ear. Besides obviating the evils already mentioned, this substitution also offers the great advantage that a steadier and milder application of electric sparks to the ear and head is obtained than with electrical machines; neither does it frighten patients, nor cause their hair to stand on ends. Naturally the patient must be in connection with *only one*



of the contact-screws of the Rumkorff coil ; the application of both electrodes would cause a very severe shock, and could not be considered entirely devoid of danger, especially in passing through the heart or the brain. But a very marked increase in the effect of the electrode can be obtained without any danger, if the other electrode be connected with the ground, through the water pipes. Instead of conduction through the earth, a larger bundle of wire can be used as the second electrode, but this will produce a more moderate increase in the effect of the different electrodes than where the earth acts as a conductor.

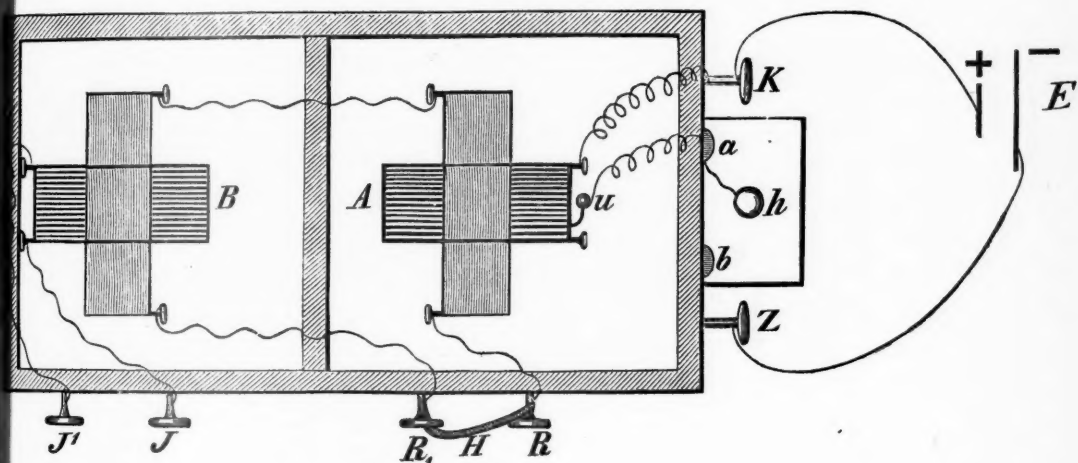


FIG. I.

After all these preliminary remarks, the construction of the duplex-inductarium must be understood by every one. It is easily transported, its case measuring 11" in length, 10" in height, and 6" in breadth. The lower part of the case is divided into two halves, the right containing the Rumkorff coil A, and the left the seconding induction coil B. The connection of the two coils with each other and with the current-commutator *h* is easily recognized in the accompanying schematic drawing. The binding-screws K and Z on the right side of the case serve for connection with the conducting cords of the element E (Grenet or any other) battery of similar strength, and are in connection with the inducing primary coil of the Rumkorff coil ; the current

enters the coil directly through binding-screw K, whilst from binding-screw Z it first passes into the conducting movable hammer *h* of the commutator. If this hammer *h* be placed midway between the two contact-points *a* and *b* of the commutator, the galvanic current is interrupted. If the hammer *h* be moved to the right upon contact-point *a*, the current of the element E enters the interrupter *u* of the Rumkorff coil and induces in the coil of fine wire of this apparatus an interrupted current of high tension. If, on the contrary, the hammer *h* be placed to the left upon contact-point *b*, individual closing and opening currents or shocks, more or less rapid, according to desire, are produced, whose mechanical effects have recently been so much lauded by Boudet.

On the front side of the case there are two pairs of binding-screws; the pair to the right R and R' are for connection with the high-tension current of the Rumkorff coil; the pair to the left, J and J', are for connection with the electrode of the lower-tension current of the secondary coil B.

If we wish to use the high-tension current of the Rumkorff-coil alone (without secondary inductor), for dry current or douche of sparks, the conducting cord of the particular electrode (brush, comb, or tube-electrode) is fastened in binding-screw R, whilst binding-screw R' is left free.

According to the choice of electrodes the spark current will be stronger or weaker. If, however, we wish the effect of a given electrode strengthened, we need only to connect binding-screw R' with the earth (by the water-pipes).

If, in an exceptional case, we wish a very strong spark current or separate electrical shocks, we need only connect binding-screw R' with a second flat electrode and to apply the latter to the neighborhood of the spot to be electrified. We are also able to diminish the effect of any spark-electrode and to reduce this to an inappreciable minimum by wetting the part of the skin to which the electrode is to be applied with pure water, or better, with a solution of salt in water. We also make use of the current of the Rumkorff coil upon a more extended area of skin, as a wet douche, if

we connect binding-screw R with the electrical douche-apparatus constructed by me, at the same time connecting binding-screw R' with the second flat electrode; if now we place the latter in the neighborhood of the part of the body to be electrified, and then let a fine rain of electrical saturated salt-solution fall upon this, a diffuse electrical excitation of the part of the body is obtained, the strength of which can be modified at will and made very severe or scarcely perceptible, according as the douche-apparatus is made to approach or recede from the body.

If we wish to make use of the current of the Rumkorff coil, the tension of which has been lowered by the secondary inductor, we must first connect binding-screws R and R' by the clasp H, and then fasten the electrode in binding-screws J and J'. When the inner inducing coil with its large central iron piece is entirely within the outer induction coil, an induced current is obtained possessing an intensity so great that it could never be used upon the ear or head. and only exceptionally upon any other part of the body. But the current can be diminished in two ways: removal of the central iron rod alone, and removal of the inner coil with its central rod from the outer coil to a desired extent, and fixing it here by means of a movable wooden ring; the latter is the better method, and enables us to reduce the current to a minimum so that it can scarcely be felt.

This modified induced current I apply in two ways: either in a dry form by employing the customary flat and spherical electrodes, or in a wet form by using a fine stream of a warm salt-solution, which is sent from my electric douche-apparatus into the ear, nose, and throat, and which serves to obviate the pain which would otherwise prevent electrification of the highly sensitive internal ear. Formerly this was accomplished by the introduction of a wire electrode into the auditory canal previously filled with a warm solution of salt; but owing to the windings of the canal, the electrode usually touches some part of the walls of the canal or the drum-membrane, despite the greatest care in introduction, and causes great pain. There have also been several cases of perforation of the drum-membrane as a re-

sult of such electro-therapeutic treatment which have come under my care. Such accidents can never occur with my method of application, even when employed by one who is not an otologist.

In conclusion I would add that a complete discussion of the results of treatment by the duplex-inductorium obtained by me will be the subject of my next communication. For the present, however, I would most warmly recommend the employment of the duplex-inductorium as a therapeutic appliance which cannot be replaced for the following cases:

The modified induced current, and especially the spark current, act in a remarkable manner as antiphlogistic agents in acute inflammatory and suppurative affections of the ear; in from three to five minutes they not only markedly diminish the subjective symptoms of irritation, such as pain and tinnitus, and often even cause a disappearance of these, but they lessen perceptibly the objective symptoms of inflammation—redness and swelling of the tissues. Generally, however, improvement only lasts from twelve to twenty-four hours, and on this account the treatment must be repeated daily, and exceptionally even twice a day. I have had cases in which a single application effected a cure. But generally from eight to ten sances are necessary.

In chronic glandular swellings in the neighborhood of the ear, in chronic periosteal swellings of the auditory canal and mastoid process, and in arthritic deposits in the auricle, I have seen remarkably rapid dissipation of the swelling upon application of the spark current a number of times, so that I believe myself justified in attributing to it a marked capacity for causing absorption.

In the well-known tedious cases of so-called dry middle-ear catarrh (otitis media hyperplastica), in which the different internal and external remedies are ineffective, it is possible sometimes to produce marked improvement with the duplex-inductorium, and almost always the disagreeable accompanying symptoms, tinnitus and headache, can be relieved in from three to five minutes. When the current is applied to one side the effect upon the patient is a very surprising one; and in astonishment he declares: "Now

the one side is perfectly clear and free from pain and noise, whilst the other half is still noisy and painful as before." This miraculous effect is explained by the change in the pressure-relations in the cranial and labyrinth cavities in consequence of contraction of the blood-vessels and muscles of the neck and ear, and it promises a future prominence of great therapeutic importance to the duplex-inductorium, not only in diseases of the ear, but also in those of the brain and its envelopes.



MALFORMATION OF THE AURICLES; BRANCHIAL FISTULÆ; CHRONIC PURULENT INFLAMMATION OF THE MIDDLE EAR; EXAMINATION OF THE LABYRINTH.

By H. STEINBRÜGGE, OF GIESSEN,

(FROM THE PATHOLOGICO-ANATOMICAL INSTITUTE AT GIESSEN.)

Translated by DR. J. B. McMAHON, New York.

THE organ of hearing, described later on, was obtained from the body of L. N., aged seventeen, a tailor, who had died of phthisis. I have the following notes of the case: N. was very weakly, even as a child, and has always coughed much. Status præsens: Small, poorly built, and poorly nourished individual; left half of the face not so well innervated as the right, naso-labial fold obliterated, mouth half open, uvula hangs obliquely towards right side. Speech hesitating, lisping. Ulceration of the nostril. Malformation of both auricles. On both sides of the neck, near the outer border of the sterno-mastoid, at the level of the hyoid, are fistulæ, out of the right of which a serous fluid occasionally drops. It is impossible to penetrate into the fistulæ farther than 1 *cm*, even with the finest silver wire, on account of the setting-up of a convulsive attack of coughing.

The autopsy disclosed: Tuberculosis of both lungs. Right side, above, a cavity large as child's fist. Nutmeg liver. Fatty degeneration of the kidneys. The right branchial fistula opened into the pharynx; the left was blind.

Only the right petrous bone with auricle was at my disposal. During life the hearing was not tested, nor were the auditory canals examined; the ability to comprehend speech seems therefore to have been sufficient.

*Right Auricle.*

This seems small in its vertical diameter, as if pressed together from above downwards; the helix is soft; where it ends in the abnormally large lobule there is a furrow running horizontally and caused by a bending of the auricle. The antihelix is cartilaginous and is separated from the antitragus by the above-mentioned furrow. It arises from a single crus; the fossa triangularis is therefore wanting. The incisura intertragica is proportionately long, the concha abnormally deep, the entrance to the meatus auditorius normal. The auricle is thickly covered with fine woollen hair on both sides.

*Macroscopic Examination of the External and Middle Ear.*

Meatus normal; in its depth is inspissated secretion, after removing which a large round perforation is seen in the middle of the drum-membrane. Through this opening yellowish epithelial masses can be seen within the tympanic cavity. Roof of tympanum abnormally thick; the atrophied head of the malleus is firmly adherent to it and comes away with a splinter of bone on chiselling away the roof; the body of the incus is pretty large in comparison with the head of the malleus, the processes almost entirely destroyed. The stapes is wanting. The labyrinth-wall shows a small, roundish depression at the site of the oval window. The promontory is not curved but flat. Floor of the tympanum thick, sclerosed; mucous membrane moderately thickened. Bony tube very wide. Tensor tympani absent.

Squamous and petrous portions very massive. Deep digitate impressions. The eminentia arcuata projects forward strongly. Aperture of the aquæductus vestibuli surprisingly wide. Mastoid process sclerosed. The long axis of the pyramid is directed sharply forward, the

tuba therefore is strongly curved with its concavity outward and is crossed by the greater superficial petrosal nerve.

*Microscopic Examination of the Labyrinth.*

Sections of the pyramid showed, in general, an increase of the bony substance, partial deposits on the walls of the osseous cochlea, semicircular canals, and ampullæ, causing marked deviation from their normal curvature. There were, moreover, displacement of the Fallopian canal and some results of a chronic periostitis and otitis. The remains of the oval window showed, on section, as a funnel-shaped cavity, filled with connective tissue, ending blind in bone and measuring 0.5 mm in diameter at its opening. Between its blind extremity and the vestibule is a layer of bone 1 mm thick, in which a fine stripe of bone substance, which chromic acid colors more deeply than the surrounding parts, thickly set with bone corpuscles, showed the completeness of the abnormal closure.

Besides this remnant of the oval window, more externally in the labyrinth-wall, lying between tympanum and vestibule, is a pathological cavity 7 mm high and 4 mm deep in places, and separated both from tympanum and from the vestibule by a layer of bone  $\frac{1}{2}$  mm thick. A network of connective tissue, with round and oval openings, filled the cavity; the open spaces contained round cells, separate or heaped together with products of disintegration; in the finer sections the round cells were also seen to be deposited in the filamentous tissue. This latter was directly connected with the periosteum of the tympanic cavity. Smaller bundles of fibres were also to be seen within the bone in the region of the semicircular canals, where they penetrated the osseous substance, forming a network. Medullary spaces were present in trifling number and of small size. Tubercle bacilli were not found.

*Cochlea.*

The membrane of the round window seemed thickened, partly ossified, and smaller than normal on account of the narrowing of the fenestra. The first turn was narrow, the

scala tympani angular, and in the neighborhood of the fenestra filled with detritus. The osseous layer of the promontory, the thickness of which at this spot, in the normal condition, measures 0.75 mm to the ligamentum spirale, was here 2 mm. The different parts of the cochlear duct were everywhere developed, and in the upper turns were normal; in the first turn, however, the organ of Corti was destroyed and converted into a granular cell-conglomerate, and in the inner angle of the cochlear canal, between Reissner's membrane and the membrana tectoria, a collection of round cells extended as far as the second turn.

*Vestibule, Ampullæ, Semicircular Canals.*

In the periosteum of the vestibule, and in the free wall of the sacculus, there is considerable rust-colored pigment. The utricle showed on its inner wall, in many spots, papilla-like deposits. The ampullæ contained much pigment, especially in the neighborhood of the nerve epithelium. In the upper ampulla a part of the nerve epithelium was converted into a gray hyaline mass. Cupulæ and otoliths present. Bony semicircular canals narrow. Membranous semicircular canals likewise of abnormally small calibre, and connected on all sides with the periosteum of the bony canals by bundles of newly formed connective tissue.

*Muscles.*

Of the tensor tympani and stapedius muscles only microscopic remnants were found. The spaces normally occupied by the muscles were filled with connective tissue, in which a few cross-sections of muscle bundles could only with difficulty be discovered.

*Nerves.*

The acoustic nerve could be followed in all its ramifications. Whether the number of fibres was normal must remain undecided, as many of the small branches running through bone seemed unusually thin. The results of the examination of the facial were, however, surprising. The first part of the Fallopian canal was displaced in conse-

quence of hyperostosis of the bone, and instead of its horizontal course, took a more vertical direction; it contained only a few scattered nerve-fibres with considerable wavy connective tissue. The defect of the facial showed already at the internal auditory meatus, but might possibly depend here on a mechanical lesion; in its farther course, as far as the geniculate ganglion, this factor could be excluded, in view of the nerve-fibres having been replaced by connective tissue. At the site of the geniculate ganglion also there was connective tissue without trace of ganglion cells or nerves. In the sections made still more externally, there was again seen a smaller cross-section of a nerve corresponding in position to the facial, which plainly could arise from nothing else than the filaments supplied by the greater superficial petrosal nerve. The contour of this cross-section, which in places was only 0.84 *mm* in diameter, alternated in the preparations between the circular and angular form; the nerve was enveloped in a ring-shaped, abnormally thick layer of connective tissue, and showed many clear, pale nerve-fibres, remaining uncolored by chromic acid. The surrounding connective-tissue was joined to the connective-tissue network of the pathological cavity already referred to. The distance of this nerve from the nervus vestibuli, which in the region of the stapes in the normal bone is only 0.5 *mm*, here measured about 3 *mm*, on account of the hyperostosis of the pyramid.

#### REMARKS.

In the absence of clinical data, this case is of interest only in its pathologico-anatomical relations. To judge from the results of the anatomical investigation, hearing on the right side must have been entirely wanting as a result of the closure of the vestibuli and the changes in the cochlea. The structures of the cochlear duct could, at most, react to bone-conduction in  $1\frac{1}{2}$  of the upper turns of the cochlea. The fact remains unexplained, that during life a left-sided facial paralysis was observed, whereas the facial muscles of the right side seemed well innervated. From the above, one would be tempted to believe that a bilateral



facial palsy must have existed during life, which was probably the more marked on the left side.

As for the failures of development, they were limited to the malformation of the auricles and the imperfect closure of the branchial clefts resulting in the two branchial fistulæ. The position and development of the labyrinth-vesicle seemed, on the other hand, to have been quite normal. There were, further, perforative inflammation of the middle ear, hyperostosis of the pyramid, and the results of periostitic processes in an individual who had died with phthisis. As the lesions of the organ of hearing were entirely overlooked, it is difficult to form a judgment as to the time and cause of the origin of the pathological alterations. From the total occlusion of the vestibule by an osseous newformation, in which the stapes was entirely lost, from the total atrophy of the internal muscles, from the size of the bony tuba, from the absence of any sensation of pain which certainly would have induced a patient of seventeen years to call the attention of the attending physician to the ear, one may, perhaps, conclude that the morbid process had begun and run its course in earliest youth. When we take into consideration the absence of tubercle bacilli in the tissues of the right ear, it seems, moreover, improbable that the disease had any connection with the patient's tuberculosis. Nor did the appearances correspond with the picture of a tuberculous caries, nor with the usual outcome of a chronic purulent inflammation of the middle ear. The inflammatory changes in the periosteum, producing the above-described changes—the hyperostosis, the narrowing and partial displacement of the canals of the labyrinth,—would rather make one think of the processes which occur as the result of syphilis.<sup>1</sup> It could, accordingly, in this case, have been a question of hereditary syphilis, with the subsequent development of tubercular phthisis and death.

This supposition is based essentially on the discovery of

<sup>1</sup> Schwartze has already discussed these relations in his "Contributions to the Pathology and Pathological Anatomy of the Ear." *Archiv f. Ohrenheilk.*, vol. iv., p. 253, *et seq.* In most cases of periostitis ossificans of the petrous bone and hyperostotic deposits, the proof of syphilis is wanting. On the other hand, a sufficient explanation of the hyperostosis is equally often lacking.

the pathological cavity in the hyperostotic labyrinth-wall, which in every respect reminded me of similar bony defects found in the petrous bones of a patient with tertiary syphilis,<sup>1</sup> and also in the labyrinth of a deaf-mute,<sup>2</sup> cases described by Moos and myself.

With reference to the origin of these spaces filled with filamentous network from inflammatory processes in the periosteum of the tympanic cavity, I would refer the reader to the explanation given in the articles cited.

Within the endolymphatic spaces, the deposits of pigment, the destruction of Corti's organ, the presence of free cells in the cochlear duct, the changes in the nerve epithelium of the upper ampulla, the papillary deposits in the utriculus, and finally the narrowing of the semicircular canals point to earlier exhausted hyperæmic and inflammatory processes.

The atrophy of the facial nerve in the first part of the Fallopian canal, as well as the abnormal adhesions of the semicircular canals to the enclosing bony walls, can be explained by periostitic processes.

It is also of interest to note, in this case, the great irritability of the membrane lining the branchial fistulæ. Heusinger<sup>3</sup> has mentioned the same condition in several of the cases reported by him. A slight touching of the track of the fistula often causes severe reflex phenomena.

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<sup>1</sup> These ARCHIVES, xv., p. 1-16.

<sup>2</sup> *Ibidem*, vol. xv., p. 123.

<sup>3</sup> *Virchow's Arch.*, vol. xxix.

## RECENT OBSERVATIONS OF THE FORMATION OF CYSTS IN THE AURICLE.<sup>1</sup>

BY ARTHUR HARTMANN, OF BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

**B**ASED upon two personal observations and a large number of cases in literature, I tried to prove in vol. xv. of these ARCHIVES that a great many affections of the auricle were wrongfully called hæmatomata, the process not being due to an effusion of blood. Therefore I suggested simply naming these cases *formations of cysts in the auricle*. In the meanwhile I had the opportunity of observing four other cases which confirm my former opinion. I beg leave to relate these observations.

CASE 1.—C. P., carpenter ; age, twenty-nine ; robust (served as cuirassier) ; Oct. 25, 1886, he felt a stinging pain in the external ear, without any other inflammatory symptoms. A rapidly enlarging tumor developed in the left auricle. This tumor was at first soft to the touch, and then became hard ; there was no proof of injury ; mental diseases were not present in the patient, nor in his family. When he first presented himself, Nov. 7th, an elastic swelling, 25 mm high and 15 mm wide, without redness, and not sensitive upon pressure, was found in the upper portion of the concha in the region of the crura bifurcata. After incision, a perfectly clear, slightly yellowish fluid was discharged. The cavity was filled with iodoformized gauze. During the next two days there was intense pain, with rigidity of the overlying skin. After a few days healing took place by the attachment of the skin to the underlying cartilage.

CASE 2 is that of a post-office official, H. K., thirty-five years

<sup>1</sup> Read at the otological section of the sixtieth meeting of German naturalists and physicians at Wiesbaden.

of age, of robust constitution. Neither he himself nor any other member of his family had suffered from mental diseases. Four weeks before his first visit, June 5, 1887, he began to complain of hemicrania of the left side. This gradually ceased, when about two weeks later a swelling appeared in the left auricle. This was noticed accidentally, the auricle being neither painful, hot, nor red, and gradually increased in size. At the first examination it occupied the lower portion of the concha, being twice the size of an almond. July 7th an incision through the entire length of skin covering it was made, and this was followed by the discharge of a perfectly clear, yellowish, somewhat viscous fluid; smooth cartilage was exposed at the bottom of the cavity. The cavity and the concha were filled with iodoformized gauze, without any bandage, changed every other day, a cure with linear cicatrix resulting in nine days.

CASES 3 and 4 occurred in Mrs. B., a short, stout woman, thirty-eight years old, who had suffered from girlhood from frequent headaches, especially at the menstrual periods. During the last five years frequent attacks of excitement have occurred, and her memory is said to have become impaired. Her oldest sister suffered as a child from convulsions; no mental diseases in the family.

The patient came under my care June 6, 1887. Two weeks previously she had noticed a swelling of the right auricle, preceded by itching. This swelling gradually increased until a week ago, when an incision was made by another physician, resulting in the discharge of a watery fluid. The following morning the swelling had again reached its former size—the same as was found at the first examination by me. The tumor fills up the entire concave portion of the concha, extending close to the tragus, and obstructing the entrance to the auditory canal. There is neither redness nor any elevation of temperature. A few days after the appearance of the tumor on the right side, the attention of the patient was called to a small tumor on the left ear. This increased slightly, being but little larger than an almond at the time of operation. It was situated at the lower part of the concha. No injury had occurred on either side.

June 7th.—Both tumors were opened by large incisions; a clear, yellow fluid was discharged as in the former. In order to provide for perfectly free discharge of secretions, a second opening was made in the outer part of the cyst wall in the right auricle, and a drainage tube was passed through both openings; iodoformized

gauze dressing. The small cyst had healed completely in a few days, but in the large one there was inflammatory reaction. The skin covering it became more dense and rigid, thus preventing the walls of the cyst from meeting, and leaving between them an open cavity filled with pus. There was intense pain during the first few days. Suppuration was considerable during the subsequent days, but subsided rapidly after removal of the drainage tube. After four weeks, the walls of the cyst again met, but a small amount of pus being discharged from the first incision, which was filled up with granulations. After cauterization with nitrate of silver, complete healing took place, leaving a pretty deep scar. Treatment lasted five weeks.

These three patients were well-nourished individuals of middle age (29, 35, and 38 years old) and with the exception of the last case, had no tendency to mental disease. In my former list only men are mentioned as affected with cysts, but among these new observations, there is a woman both ears of whom were implicated at the same time. In none of the four cases had injury preceded the appearance of the tumor. The tumors had existed an average of two weeks before incision; their contents always consisted of a perfectly clear, somewhat yellowish fluid; no reddish or blackish color, no masses of detritus, and no shreds of fibrin were found in any case which could have indicated a previous hemorrhage.

In all cases the cartilage was exposed at the bottom of the cyst. In three cases healing resulted in a few days; in one case it took five weeks on account of the occurrence of suppuration.

Besides hæmatoma, the question arises, whether we should not consider the process as an inflammatory one and the disease as perichondritis? In three of the cases, the contents of the cysts were examined for the existence of micro-organisms, by transferring parts of the fluid to gelatin. All the inoculated tubes remained sterile, giving evidence that no micro-organisms existed in the cyst contents. Nor had there been any inflammatory symptoms in any case.

Since it would not be proper to call the process hæmatoma or perichondritis, it appears to be most judicious to consider the disease a formation of cysts in the auricle.



MARKEDLY PROTRACTED COURSE OF SUPPURATIVE OTITIS MEDIA IN THREE CASES OF TUBERCULOSIS.

BY A. EITELBERG, AURIST AT THE GENERAL POLICLINIK IN VIENNA.

Translated by Dr. MAX TOEPLITZ, New York.

**I**N the course of about six months I have met several cases of otorrhœa in tuberculous patients, which were remarkable on account of their peculiar prodromic stage. Suppurative inflammation of the tympanum in advanced cases of tuberculosis is apt to lead rapidly to a more or less extensive perforation of the membrana tympani, unaccompanied by much pain. There is usually but an interval of some days from the first occurrence of inflammatory signs to the perforation of the drum-membrane; hardly ever one of many weeks.

The lengthy duration of the prodromata of the purulent tympanitis preceding the full development in these three cases, was what seemed remarkable to me. The patients were, undoubtedly, tuberculous individuals. Their entire appearance was so characteristic that the diagnosis could be made at first sight. All presented the picture of tuberculous cachexia: great emaciation, constant coughing and hacking, hectic flush upon the cheeks. Besides, the diagnosis in two cases was confirmed by the family physician. Night-sweats occurred in all three cases; and profuse hemoptysis had repeatedly endangered the life of one of them. After a severe hemoptysis, which was the means of confining the patient to bed for some time, the first symptoms of

aural disease appeared in one of the cases. I shall return to this case later, since I had the opportunity of studying it more carefully than the other two.

At the first examination of all the cases, I could only diagnosticate acute catarrhal inflammation of the tympanum. The patients complained of hardness of hearing, tinnitus, and obstruction; the membrana tympani was retracted, dull, the vessels along the handle of the malleus being slightly injected; pain was either not complained of or was very slight.

One patient consulted me in the beginning of September, 1886, on account of his aural affection; being compelled to return to his home in the country immediately, I advised him to employ Politzer's method, and suitable treatment of the naso-pharyngeal space. About the middle of November the patient called again, accompanied by his family physician, who informed me that for the previous week there had been a discharge from the ear of his patient, and that this had been the occasion of his trip to Vienna. Examination revealed a purulent otitis media with perforation of the membrana tympani. I advised the instillation of a four per cent. solution of boracic acid at first, and then, if this failed, the use of iodoform powder after a preliminary syringing with lukewarm water and the employment of Politzer's method.

This treatment was commenced in the second case also; but as to the further course, I regret to say, I was not informed.

All the patients were comparatively young, one being about twenty-five, the other two each in the thirties.

The case referred to above occurred in a man of thirty-two. He presented himself December 29, 1886. A continuous and troublesome tinnitus had lasted two months, and had prompted him to consult a physician, who had tried instillations of oil and syringing of the ear, naturally without success. Hearing was considerably diminished on the right (diseased) side; the watch was heard at 5 cm; the whisper only when spoken directly into the ear, figures being heard better than other words; hearing-distance normal on the left side. The epidermis of the drum-membrane was slightly macerated and partly loosened in continuous lamellæ, probably in consequence of the instillations of oil in the lukewarm injections.

After removal of the lamellæ, the membrana tympani appeared to be somewhat bulged out in its posterior portion, of a grayish dullness, and injected along the handle of the malleus. The right tube was narrowed; a probe of  $\frac{3}{4}$  mm in thickness could hardly be passed. In catheterization, a faint blowing sound accompanied by râles is heard. The treatment consisted in probing the Eustachian tube, together with the injection of a few drops of a very weak solution of tincture of iodine. In the meantime, the bulging out of the posterior half of the drum-membrane had increased and the original disturbances had remained unchanged; I therefore decided to perform paracentesis (January 15, 1887), though reluctantly on account of the primary affection. Suppuration remained moderate during the whole period of observation; tinnitus was now modified by intermissions, and the hearing improved so that the whisper could be heard well at a distance of 50 cm. A probe of  $\frac{3}{4}$  mm in thickness could easily be passed through the isthmus of the tube. No noticeable change appeared as long as the patient was under my observation—until the middle of February.

From the literature of the subject may be mentioned Schwartz's<sup>1</sup> views: "It is doubtful whether the frequent cases of otorrhœa with perforation of the membrana tympani occurring in the last stage of phthisis, which do not reveal any hyperæmia and swelling of the mucous membrane of the tympanum at the autopsy, and which differ entirely from the regular course of acute suppuration of the tympanum by an absence of all pain, ought to be classified with primary purulent inflammation of the tympanum. According to clinical observations I am inclined to consider the tuberculosis of the drum-membrane as the primary disease." Elsewhere,<sup>2</sup> this author states that he has often observed tubercles of the membrana tympani followed by rapid ulcerative destruction in *chronic tuberculosis of the lungs in adults*; and that in the subsequent course cheesy inflammation of the mucous membrane of the tympanum may be added to tuberculous disease of the drum-membrane.

In the more fully reported case I could determine that the affection started from the Eustachian tube and the tympanic

<sup>1</sup> Schwartz: "Die chirurgischen Krankheiten des Ohres," p. 171.

<sup>2</sup> *L. c.*, p. 124.

cavity ; and I am justified in believing that in the other two cases the affection developed in a similar manner.

The slow progress of the inflammatory symptoms is remarkable under all circumstances, whether we suppose that the aural disease began as a simple catarrh of the middle ear and was then transformed, possibly by the progress of the tuberculous auto-infection into a suppurative otitis media, or, on the other hand, that the process was suppurative from the start, but beginning with mild symptoms.

Upon the whole, such cases are rare ; that they are still more rarely observed, may easily be explained as follows : During the severe stages of tuberculosis, the physician and the patient are too much concerned to pay much attention to a "little" tinnitus and obstruction of the ear. But after the alarming manifestations of this terrible affection of the lungs abate, the disturbances caused by the affected ear are felt more prominently, and the patient, sanguine of a complete recovery, as these patients always are, now pays more attention to the "lesser evil."

## INFLUENCE OF THE USE OF THE TELEPHONE UPON THE HEARING POWER.<sup>1</sup>

By CLARENCE J. BLAKE, M.D., BOSTON.

THE assertion made by the writer several years since, that the habitual use of the telephone would be prejudicial to the hearing in many cases where the hearing was already impaired, was based upon the well-known facts of the process of accommodation in the middle ear for the transmission of tones of low intensity, of the susceptibility of the percipient apparatus to shock from sharp sounds of high intensity under the conditions of that process, and upon the results of measurements of the vibrations of telephone discs made for the purpose of determining approximately the loss of power between the transmitting and receiving telephones. These experiments, the results of which were embodied in a paper read before the British Society of Telegraph Engineers in London in 1878, consisted in connecting two hand telephones, similar to those at present in general use, by means of flexible wires and recording the excursions of the discs of both the transmitting and receiving telephones by means of fine platinum wires tracing upon smoked glass. The excursion of the transmitting telephone disc without the magnet was first recorded, the average for all the readings for a constant tone of 448 vibrations measured under the microscope, with micrometer eye-piece being 0.2625 millimetre. The deflection of the centre of the disc under magnetic attraction was 0.061 millimetre, the result of this being a decrease of the

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<sup>1</sup> Read before the Am. Otological Society, Washington, September, 1888.



excursion in response to the same tone to 0.180 millimetre, a difference in the length of the excursion of 0.0725 millimetre, or about 27.65 per cent.

The movement of the receiving disc, as recorded on the smoked glass, was so slight that a large number of tracings was made, the average of which was, however, always within 0.02 millimetre, and controlling tests were made by means of a micrometer screw, reading to one-thousandth of a millimetre, connected with a delicate galvanometer, the results gained confirming the previous measurements of the transmitting disc and determining the average excursion of the receiving disc at 0.0135 millimetre, a loss in motion of 92.9 per cent. between the two telephone discs. This loss of intensity is in a measure compensated for by the effort made in the ear itself to accommodate itself to the transmission of tones of low intensity, which effort, in its prime degree, can be maintained, as shown by experiment, for little more than fifteen seconds, at the end of which time the symptoms of fatigue (in a decrement of the hearing) begin to appear. Under this condition the ear is peculiarly susceptible also to the shock of such sharp metallic sounds as are constantly occurring in the practical use of the telephone. Estimating the amount of power in sound transmitted to the ear from the receiving telephone as but 7.1 per cent. of that which actuates the transmitting disc, the compensation required of the ear would seem to be considerable, particularly when it must be sustained for a long period, but when the attempt to estimate the percentage of the loss of the difference between consonant sounds of nearly the same logographic value, and consonant sounds, moreover, the pneumatic value of which results in a damping of the transmitting disc—by driving it further toward the magnet,—it is infinitely greater.

Soon after the experiments above mentioned were made, the microphone transmitter, using a battery current, came into general use, and it seemed advisable to review the subject in the light of experiments more delicate and more accurate than the crude measurements made ten years ago.

For the results which follow I am indebted to Prof. W.

W. Jaques, of the American Bell Telephone Company, who, connecting a Blake transmitter with a hand telephone by a wire circuit, and comparing the values between sound aërially and telephonically transmitted, as measured by the distance from the ear, came to the conclusion that the speech given out by the receiver on a short line is approximately one ten-thousandth of the loudness of that going into the transmitter.<sup>1</sup>

By a still later series of experiments the extent of the accommodative power of the ear, and correspondingly the demand made upon it, is still further illustrated. Connection was made between the New York and Boston offices of the Telephone Company and the laboratory of the Massachusetts Institute of Technology in Boston, by means of a complete metallic (copper) circuit. The distance over this wire from the New York to the Boston office was 260 miles, and from the Boston office to the laboratory of the Institute, two miles. A Hunnings transmitter was placed at each of these stations, and at the Institute of Technology; an electro-dynamometer was also included in the circuit.

On speaking into the transmitter at the Institute, the electro-dynamometer gave a deflection of 22. millé amperes, speaking into the transmitter at the Boston office the current was 0.48 millé amperes, and speaking at New York it was 0.02 millé amperes; the current was thus eleven hundred times as strong from the transmitter at the Institute as from that in New York; and yet the conversation was

<sup>1</sup> "Taking D as the aërial and d as the telephonic transmission, the squares of the distances D and d should give an approximate measure of the loudness of speech going into the transmitter (T) and coming out of the receiver (R):  $\frac{D^2}{d^2} = E$  = the efficiency of the system or the relation of the sound emitted to that extent.

"The mean of the first series of experiments was

"D = 240 in. } E = .00011  
d = 2.5 in. }

"The mean of a second series was

"D = 360" } E = .00009  
d = 3.2" }

"With two hand telephones, one as a transmitter, the other as a receiver :

"D = 360 in. } E = .000005  
d = 0.8 in. }

"Under a microscope, the movement of one electrode of a transmitter relative to the other was .00025 in., and the movement of the receiver disc was .000005 in. or less."—Extract from letter dated Boston, Nov. 14, 1887.

distinctly audible in both cases, and the ear did not recognize any enormous difference in the intensity of the sound.<sup>1</sup>

These facts so amply confirm the previous statements that they should be well borne in mind, especially since the telephone is an instrument the use of which will, in the future, increase rather than diminish, and since it is, moreover, not likely, with our present knowledge, to be essentially improved, the principal gains in clearness and distinctness of sound transmitted having to come from improvements in the means of communication rather than from changes made in the receiving instrument itself. All attempts at damping the high metallic overtones and improving the qualitative distinction between the consonant sounds as heard, by changing the structure of the receiving telephone, having resulted in a corresponding loss of that intensity, of which, as has been shown, there is so little to spare.

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<sup>1</sup> Extract from letter dated Boston, June 20, 1888.

## WHAT CAN THE HUMAN EAR HEAR WITHOUT THE STAPES?

BY E. BERTHOLD, OF KÖNIGSBERG.

Translated by J. B. McMAHON, New York.

**I**T is not long since the view universally prevailed that loss of the stirrup was always accompanied by complete deafness in the corresponding ear. This opinion seemed well established by the large number of pathological examinations of deaf-mutes, in which the only morbid appearance recognized was the absence of all the auditory ossicles. Accordingly, we find in the text-book of Toynbee, 1860, the following statement: "There can be no doubt, I think, that the malleus, the incus, and even the crura of the stapes may be removed without serious impairment of hearing. There is, however, no well authenticated case in which the base of the stapes has been removed without the production of complete deafness. This deafness, however, must doubtless be ascribed to the loss of the labyrinth fluid occurring simultaneously with the separation of the stapes."

From the remark, "there is, however, no well authenticated case in which the base of the stapes has been removed," etc., we might infer that the attempt had already been made to remove the stapes in the human subject by operation; and yet I have not succeeded in finding any confirmation of this conjecture in the literature of otology. Kessel must therefore be regarded as the first who instituted experiments on animals (dogs and doves) in order to ascertain what influence the extraction of all the ossicles, including the stapes and columella, would exert upon the

hearing and upon the general condition of the animals. In these experiments the animals showed no change in the position of the head, and preserved their normal gait and flight after the operations. Neither vertigo nor other disturbances of coördination were observed. The hearing seemed abolished only for the first week after the operation, *i. e.*, as long as the discharge from the ears lasted; after this time it was gradually restored. The autopsy of such animals showed that the foramen ovale had been closed in by a newly formed membrane. In spite of these attempts, which seem to demonstrate the relative freedom from danger to life and health of the doves operated upon in removing the columella, Kessel has not as yet removed the stapes in the human subject, but has contented himself with the cutting out of the drum-membrane and mobilization of the stapes, with a view of curing certain forms of hardness of hearing. Other otologists have also hesitated to remove the stapes, and for the reason advanced by Schwartze in his manual, *i. e.*, that a purulent inflammation of the labyrinth and meningitis were to be feared as a result of the operation, and that any operation proposed for the improvement of hearing or for the removal of harassing tinnitus must be considered unjustifiable if it has not been proved positively free from danger *quoad vitam*.

In view of our incomplete knowledge of the results of extraction of the stapes in man, the following case observed by me may be of interest:

February 24, 1887, Augusta Lange, of Königsberg, aged thirty-eight, came under my treatment, suffering from a marked loss of hearing in both ears. Of the previous history I shall only state that the patient had had repeated attacks of otorrhœa. No further information with regard to the ear disease could be obtained. Up to Christmas, 1886, she claims to have heard better with the left than with the right ear; at this time, however, the left ear, she claims, became closed, and since then has had less power of hearing than the right. At the first examination a perforation of moderate size was found in the left ear, with partial adhesion of the edge of the perforation to the opposite wall of the tympanum. The left ear is interesting only because the hearing was so poor



that it did not disturb the hearing-tests made with the right ear. The right ear, with which alone we have to do in this case, could hear a watch neither from the auricle nor from the bones of the head. The patient, however, clearly perceived the sound of a large tuning-fork from both places; she also understood loud-spoken words at short distances. Examination of the drum-membrane showed no perforation, and the short process and handle of the malleus were plainly recognized; the color of the drum-membrane was a dead-gray, the light spot absent; the epithelium seemed thickened. In the posterior section of the drum-membrane, on a level with the umbo, was a round spot, which looked as if the membrane were softened here; its epithelium was loosened and seemed macerated. Touching with the probe, however, showed the spot to be as hard as bone. No trace of movement of the drum-membrane could be recognized by exhaustion, and compression of the air in the external canal with a Siegle's speculum. Upon inflating the ear by means of a catheter, vertigo, and impairment of the hearing were observed.

During the examination on the following day, February 25th, a blood-red stripe showed itself on the inner border of the spot referred to above; this stripe runs almost parallel with the manubrium mallei. On being questioned, patient says that since yesterday, on blowing the nose, air has hissed through the ear. On February 26th, I presented the patient at the Poliklinik, and diagnosed complete adhesion of the drum-membrane to the opposite wall of the tympanic cavity, partial ossification of the drum-membrane in its posterior segment, with a recent tear at the border of the ossified part, probably resulting from the inflation of the ear. When I saw the patient on the following day, her general condition was worse; she complained of dizziness, and chilly sensations in her limbs.

This feverish condition seemed dependent on the ear disease. Since, during the last few years, I have repeatedly cut through even extensive adhesions with good results (which I shall report in full later), I decided to free the synechiæ as far as possible in this case also. I performed the operation with a synechotome of my own construction, which I shall also describe later. As the fresh rent in the drum-membrane seemed the most suitable point for the introduction of my instrument, I attempted to widen it some by forcible inflation, then passed the synechotome through it into the tympanic cavity, and made a slow turning motion with

the blade. I had scarcely begun, however, when the round bony piece tilted up with the edge inclined to the surface of the drum-membrane. I at once withdrew the synechotome from the tympanic cavity, and attempted to remove the bit of bone with a small hook which I am accustomed to employ in extracting foreign bodies from the external canal. The attempt succeeded. However, my astonishment was great when the extracted piece of bone showed itself to be the entire stapes, base included. During the operation only a few drops of blood had flowed, and these I wiped away with cotton wet in salicylated glycerine. After cleansing the wound, I devoted my entire attention to observing if any fluid would escape from the labyrinth. The opening in the drum-membrane, corresponding to where the base of the stapes had rested, remained dry. The hearing of the operated ear seemed unchanged to me, although the patient asserted she heard better. So long as she remained quietly sitting in the operation chair, she made no complaint of dizziness ; on standing up, however, the right leg doubled up under her, as we often have occasion to see in doves with one-sided injury of the semicircular canals. The patient was driven to her home (about three kilometres from the clinic), where she was put to bed at once. On the way to the cab she always had the sensation as if there were steps before her, and as if she were going up hill. At home, in bed, she felt as if the bed would rise up, and be so shaken as to almost throw her out ; so that occasionally she cried out with terror.

When I visited the patient on the following day, I learned that she had had very little sleep during the night, but was again feeling better. I had her stand up for a moment, in order to observe her gait ; she staggered some, but the dizziness left her on sitting down again. I found the auditory canal dry, but the edges of the perforation swollen. The following night the patient slept better. The next day she came to me, walking the whole way, notwithstanding that I had strictly forbidden her to go out ; she said by way of excuse that it was disagreeable to her to oblige me to visit her again at her house. On examination I now found a slight secretion, with deterioration of the hearing. The sickness of one of her children prevented the woman from again visiting the Poliklinik till April 7th ; there was still a slight amount of secretion in the drum-cavity, and the patient could only hear loud speech at a short distance. As so trifling a secre-

tion at times dries up on closing the opening in the drum-membrane, I fastened a piece of egg-membrane over the perforation ; the patient at once said she heard much better, and now upon testing of hearing, she was found to hear whispered speech at about fifteen feet, and this, too, without the stapes. Error was excluded, because the other ear, as already stated, was also diseased, and only able to hear loud speech near by. The egg-membrane remained in place only two days and was then lifted up by the secretion. Upon its removal the hearing returned to its former condition. Since then I have tried the occlusion with the egg-membrane several times, when the discharge from the tympanic cavity seemed to have stopped entirely, and each time with the same surprising improvement in hearing. Unfortunately, however, after closure of the perforation in this way, the discharge always reappeared ; so that the patient, who was so busy with the care of her little children that she could with difficulty find time to make the long trip to my Poliklinik, gave up all hope of further improvement and withdrew from treatment.

The case is noteworthy in many respects. For although it happens not infrequently that the ossicles, and among them the stapes, are freed from their connections by inflammatory processes, it must be very exceptional to find the stapes turned in the drum-cavity with its base attached to the drum-membrane. It is remarkable that no scar could be recognized on the drum-membrane. It is also surprising that the patient complained of such violent vertigo and such marked disturbances of coördination during the first twenty-four hours after the operation, although no discharge of labyrinthine fluid was observed and therefore must have been very trifling, if any existed at all. But even if there had been a flow of labyrinthine fluid which had escaped my observation, the behavior of the patient does not accord with the observations made on the doves operated by Kessel. From such observations on doves we are probably not justified in drawing conclusions with regard to the human subject.

As regards the degree of acuteness of hearing in the ear in question, the case is thus far unique ; for it is, to use Toynbee's words, the first well authenticated case in which

loss of the stapes was not followed by complete deafness, but in which a tolerable degree of hearing remained; without stapes and with coexisting perforation of the drum-membrane loud speech was heard near by, and upon mechanical closure of the perforation whispered speech was understood at fifteen feet.

That the view held by Erhard, with regard to the action of the artificial drum-membrane, cannot explain the improvement in the hearing, needs no argument; for in the absence of the stapes there can be no question of the possibility of the artificial membrane acting upon loosely articulated ossicles in such a way as to bring them into a position better adapted for sound conduction.

It seems to me that sufficient importance has not as yet been attached to the rôle which the annulus tympanicus plays in the improvement of hearing following the use of an artificial drum-membrane. I would draw attention to the experiments of J. Müller, in which the vibration of a ring over which a membrane is stretched, is plainly felt with the hand when a sounding tuning-fork is brought near the membrane; the ring itself, without membrane, cannot be set into vibration which is appreciable to the hand, by the sounding fork.

Although the above-mentioned case cannot be cited in justification of the extraction of the stapes in this case, since the operator's hand may not easily imitate what nature accomplishes through an inflammatory process, the fact remains that relatively good hearing is possible without the stapes.

#### SUPPLEMENT.

I have learned from Dr. Kessel of Jena, in a communication which reached me after despatching the above article, that he has extracted the stapes in one case in man. The case is briefly referred to in an essay entitled: "On Mobilization of the Stapes by Cutting Out the Drum-Membrane, Malleus, and Incus in Cases of Impervious Eustachian Tube" (*Archiv f. Ohrenheilk.*, vol. xiii., p. 85).

The passage reads: "I expect a positive effect only upon extraction of the stapes and for reasons which I have already

communicated (*Archiv f. Ohrenheilk.*, vol. xi., p. 214). That this operation can be done without danger to the patient is proved by a case in which I cut out the stapes in the presence of Mr. Rzehaczek and his assistants."

Kessel makes no statement with regard to the hearing of this patient after the operation.

It is a pity that Kessel has published nothing further on the extraction of the stapes in man since the publication of this case (April, 1877) some eleven years ago, and that he has omitted to describe his method of operation and the instrument used in it more in detail, for they certainly deserve imitation.



REPORT ON THE PROGRESS OF OTOTOLOGY  
DURING THE SECOND HALF OF THE  
YEAR 1887.

By A. HARTMANN, BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

C.—PATHOLOGY AND THERAPEUTICS.

α.—GENERAL LITERATURE.

1. Prof. F. BEZOLD, Munich. Statistical report on the ear-patients treated from 1884 to 1886 inclusive. *Arch. f. Ohrenheilk.*, vol. xxv., p. 202.
2. KOLL. Communication upon the work done at the university polyclinic for ear-patients at Bonn, during the year 1886 to 1887. *Ibid.*, p. 73.
3. RHODEN, R. and KRETSCHMANN, F. Report on the work of the royal university polyclinic at Halle a. S., during the year 1886. *Ibid.*, p. 106.
4. SZENES SIGISMUND, Budapest. Report on Prof. JULIUS BÖKE's dispensary for ear-patients, in the Rochus hospital, during the year 1886. *Ibid.*, p. 55.
5. MARIAN, A., Aussig (Bohemia). Report on the ear-patients treated in 1885 and 1886. *Ibid.*, p. 63.
6. HEDINGER. Report of the sanatorium for ear-patients in Stuttgart, from 1883 to 1885. Stuttgart, 1887.
7. SCHULTE, ED., Milan. Il primo semestre del mio ambulatorio per le malattie dell' orecchio e del naso a Pavia. *Gaz. med. Italiano-Lombard.*, 1887.
8. SCHMIEGELOW, Copenhagen. Beretning fra Commune-

Hospitalets Klinik for Oere-, Naese-, Hals sygdomme. *Hospitalstidende*, 1887, 3, R. 5, B. N. 22.

9. MATTHEWSON, PROUT, and RUSHMORE. Brooklyn Eye and Ear Hospital Report for 1886.

10. KIPP, C. J. and RANKIN, Wm. Seventh annual report of the Newark Charitable Eye and Ear Infirmary, 1887.

11. Prof. Dr. BEZOLD. Brief remarks on heredity in ear diseases. *Münch. med. Wochenschr.*, 1887, No. 27.

12. LANNOIS, M. De l'oreille au point de vue anthropologique et médico-légal. Lyon, 1887.

13. GELLÉ. Vertige de Ménière. Trois observations avec autopsie et considérations. *Ann. des malad. de l'oreille*, etc., 1887, No. 9.

14. ROSENBACH OTTOMAR, Breslau. On disturbances of hearing in cases of slight peripheric facial paralysis. *Centralbl. f. Nervenh. etc.*, 1887, No. 12.

15. LANNOIS, M., Lyon. Lésions de l'appareil auditif et troubles psychiques. *Revue mens. de laryngol., a'otol.*, etc., 1887, No. 12.

16. EITELBERG, A., Vienna. On the causative connection of rhachitis and diseases of the hearing organ in children. *Fahrh. f. Kinderheilk.*, etc., vol. xxvii., Nos. 1 and 2.

17. GELLÉ. Leucocythémie. Début par de la surdité et de la paralysie de la face. *Revue mens. de laryngol., a'otol.*, etc., 1887, No. 12.

18. CORRADI, CORRADO, Verona. Deafness cured by pilocarpine. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 33.

19. HUNT, MIDDLEMASS. Alarming syncope from syringing the ear. *The Lancet*, Oct. 15, 1887.

20. BARATOUX, J. De l'audition colorée.

21. BACON, GORHAM. A report of twenty-one cases of traumatic lesions of the ear. *N. Y. Med. Journ.*, May 7, 1887.

22. SEXTON, SAMUEL. Injury of the ear caused by the blast of a bursting shell; with some remarks on the effects of explosives on the organ of hearing in warfare. *Med. Record*, February 19, 1887.

23. SEXTON, SAMUEL. Boxing the ears. *Med. Record*, June 11, 1887.

24. UECKERMANN, Christiania. Vore Dövstumme. *Tids-*

*skrift for practisk Medicin*, vol. v., Nos. 12, 14, 16; vol. v., Nos. 2 and 3.

24 a. BONDE HUGO. Contribution to the statistics of carcinoma of the upper facial region. Dissertation. Berlin, 1887, L. Schumacher.

24 b. GINGER, S. Clinical contributions to injuries of the head. Dissertation. Leipzig, 1887, J. B. Hirschfeld.

1. BEZOLD, as in preceding reports, makes a very careful statistical résumé of his clinical service. He points out, "that uniformity in occurrence and in origin of diseases in a sufficiently large material applies to aural diseases as well as to other disorders of the system." Among 4,670 ear-patients, 1,110 cases of diseases of the external ear (23.8%), 3,000 of the middle ear (64.4%), and 550 of the labyrinth (11.8%) were observed. Bezold is pleased to note an increase in the percentage of diseases in children (18-22.1%). A typical exostosis of the osseous meatus in children was never observed. Swellings of the Eustachian tubes and diseases of the labyrinth increased in number; this was due to the influence of Rinne's experiment upon the diagnosis. There are also given the percentages of the different chronic, non-suppurative diseases of the middle and inner ear, most of which failed to show any objective signs; also the frequency of their important symptoms (subjective noises and vertigo); also the distribution of age and sex, and, finally, the existing hereditary relations. The statistical results of the antiseptic treatment of acute and chronic suppurations of the middle ear are of particular interest.

2. From KOLL's report of the university polyclinic at Bonn, we may note especially the experiments made with powdered iodo-insufflations into the ear. The remedy effected a speedy cure in non-complicated cases of acute and chronic suppurations of the tympanum. Caries and formation of granulations were not markedly influenced by the drug. Iodo is by far less valuable than boracic acid, on account of its irritant qualities.

3. At the aural clinic of the University of Halle, 1,213 patients were treated during 1886. Several interesting histories of cases are added to the statistical report.

4. In BÖKE's dispensary, 1,401 ear-patients were treated in 1886.

5. MARIAN's report comprises 572 patients.

6. HEDINGER's report contains, in addition to numerous histories of cases, full and elaborate accounts on the author's expe-

rience with various methods of treatment, especially with those lately recommended. The great length of the report (223 pages) prevents us from giving a more detailed review.

7. SCHULTE reports the work of his dispensary for aural and nasal diseases at Pavia during the first half of the year. Ninety patients, with 120 different diseases, were treated, and 31 operations performed.

8. SCHMIEGELOW reports 1,110 patients (aural, nasal, and throat diseases) treated in the out-door department of the Commune Hospital, at Copenhagen, in 1885 and 1886. Numerous histories of cases. VICTOR BREMER, Copenhagen.

9. In the Brooklyn Eye and Ear Infirmary, 1,603 cases of ear diseases were treated in 1886. The following important operations were performed: 5 Wilde's incisions, 6 polypi, and four paracenteses of the drum-membrane. SWAN M. BURNETT.

10. In the Newark Eye and Ear Dispensary, 1,092 cases were treated in 1886, among which were 56 affections of the auricle, 269 of the external meatus, 746 of the middle ear, 6 of the inner ear, and 11 unclassified. The most important operations were: 27 paracenteses of the membrana tympani, 5 incisions of abscesses of the mastoid process, 1 perforation of the mastoid cells, 1 removal of necrotic bone of the mastoid, and 11 aural polypi.

SWAN M. BURNETT.

11. BEZOLD found that from 1881 to 1883, of 572 patients with affections of the middle ear with negative result of the examination (where nothing could be detected by examination of the drum-membrane, or of the cavities of the middle ear), 30.06 per cent. showed a taint in one or more of the ascending line, or in brothers and sisters; but that only 21.3 per cent. of the nervous forms of ear affections, comprising 204 patients, showed heredity. Among his patients during the three years from 1884 to 1886, there were 43 per cent. with hereditary taint among 500 affections of the tympanum, and 28.6 per cent. among 381 affections of the inner ear. Bezold, therefore, agrees with Moos and others, that hereditary influences are undoubtedly exerted upon dry catarrh of the tympanum, developing, in most cases, in middle age.

12. LANNOIS describes, after an anatomical introduction, the various forms of the auricle. The examination of 43 ears of criminals did not reveal a greater frequency of deformities than exist in non-criminals. As regards the deformities accompanying mental diseases, Lannois takes the skeptical view that there are

neither characteristic nor constant changes. The form of the ear may prove a very valuable means of identification in criminals. Direct and indirect traumatic lesions and their medico-legal relations are fully treated of. Hæmatoma of the auricle occurs more frequently in males than females. According to BONNET, blood tumors of the ear should be considered as congestive apoplexies, produced by degeneration of the sympathetic nerve; but according to the examination of CL. BERNARD, BROWN-SÉQUARD, SCHIFF, and others, parts of the medulla oblongata exert a trophic influence upon the ear. The traumatic origin of hæmatoma is confirmed by the experience in lunatic asylums, where the occurrence of hæmatoma ceases after the discharge of nurses. In the tympanic cavities of persons who had died by hanging, effusion of blood and rupture of the membrana tympani were found. Of especial importance is the examination of the tympanic cavity in the drowned. According to BONGIER, water was found in the tympanic cavities in twenty-one out of twenty-seven drowned persons. Among twenty-one persons who were dead before entering the water, it was found in the tympanum once only. After more careful examination, water was always found in the tympanic cavities of the drowned. The existence of air in the tympanic cavity in the new-born proves that respiration had taken place.

13. GELLÉ reports three cases in which affections of the middle ear (sclerosis, suppuration of the middle ear, and thrombus) were associated with vertigo. The autopsy revealed ankylotic changes of the ossicles and the windows of the labyrinth. The author arrives at eight conclusions, of which the following are the most important:

*a.* The result of these three autopsies shows that the typical (Ménière's) vertigo may exist for several years without any change in the labyrinth or cochlear nerve.

*b.* The vertigo is observed in the most varying affections of the middle ear.

*c.* These affections of the middle ear have in common ankylosis of the ossicles, especially of the stapes in the oval window, and the occlusion of the round window.

*f.* In order to understand how the affections mentioned under *c* cause vertigo, it is necessary to conceive the idea of an existing hyperæsthesia and hyper-irritability of the acoustic nerve. (The affections mentioned above also occur without vertigo.)

*h.* Finally, we can consider the integrity of the nerves sup-



plying the labyrinth and the cochlea, as proven when the function of hearing is preserved, notwithstanding vertiginous symptoms.

14. ROSENBACH tries to draw attention to the probably quite frequent coincidence of rheumatic paralysis of the facial nerve and hardness of hearing. The author has observed three cases, in which paralysis suddenly appeared on the left side of the face twice, and once on the right side, without any previous affections of the ear on either side. In all three cases the acuteness of hearing on the paralyzed side was reduced to one half that of the healthy side. After treatment with the intermittent current the paralyses disappeared in from fourteen to twenty days, and at the same time the former acuteness of hearing was restored. The author offers two explanations of this observation: (1) paralysis of the stapedius, and (2) double action of the rheumatic "noxa" upon the facial and upon the acoustic nerve.

15. LANNOIS emphasizes an experience gaining ground every day among physicians on mental diseases, that in a great number of hallucinations and mental diseases the most varying organic changes play a very important rôle. Diseases of the organ of hearing are of especial etiological importance. Among 45 cases mentally diseased, Lannois found 19 with well-recognized hardness of hearing, of which 14 had hallucinations. Of the remaining 26 cases, there were 14 with aural diseases and 12 with hallucinations without affections of the ear. Lannois concludes from his examinations that in all patients with aural hallucinations the ears must be examined, since suitable treatment may lead to cure.

16. EITELBERG found, among 250 cases of rhachitis, 25 cases of purulent otitis media, for which no other cause than the rachitic process could be discovered. In 5 cases there were affections of the external ear, eczema of the auricle and of the external meatus.

17. GELLÉ reports a case of leucæmia, the first symptoms of which were hardness of hearing and facial paralysis. He relates the full history of the case from its development and course to the fatal issue. The post-mortem examination could not be made.

18. CORRADI's patient, 88 years old, had contracted slight hardness of hearing from an injury in his 41st year. During the last three years a bilateral, slowly-progressing impairment of hearing resulted, so that when the patient first came under treatment he could not hear spoken words even through a large hearing-tube. Finally the additional impairment suddenly appeared.

After the ninth hypodermic injection of a 2-per-cent. solution of pilocarpine, loudly spoken words were heard without the aid of the hearing-tube. At the end of the treatment (24 injections) the hearing distance for the loud voice was 4 metres for the right and 50 centimetres for the left ear.

19. HUNT was called to see a boy, three years old, whom he found in deep coma with slow, irregular respiration, rapid pulse, livid lips, cold extremities, and enlarged pupils. This condition was produced by syringing the ear, and lasted over half an hour.

20. BARATOUX gives the name of colored hearing to an affection which may be described in the following way: In certain individuals sounds produce at the same time certain perceptions of colors, and *vice versa*; e. g., with the letter I the perception of red, with O that of white, and with E that of gray. These observations had been made before by students at Vienna and Zürich, who found that in 596 persons about 12 per cent. were affected in the manner described. One portion of the persons examined included near relatives, another those affected with hysteria, but the greater number were males. The cause of the phenomena is not explained, in spite of the great length of the paper, although the author intimates the probable existence of "facial hallucinations in these cases," but not reflex phenomena. URBANTSCHITSCH.

21. BACON gives more or less complete notes of all cases. Among the important facts we find that inflammation of the external meatus was caused by the introduction of hair-pins in six cases, in other cases by needles, small pieces of wood, ear-spoons, etc. The drum-membrane had been ruptured by a fall in one case, by a blow in another, and by the loud report of a cannon in a third. In two cases snow-balls had caused the injury. The author is inclined to believe that in most cases of traumatic rupture by rarefied or condensed air, the membrana tympani had become weakened by a catarrhal process or calcification. The medico-legal aspects of such cases are also discussed.

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22. SEXTON reports, in his exhaustive paper, the results of examinations of the ears of eight men who were standing near an exploding shell. In six the drum-membrane was ruptured, in some to a great extent. In all these cases the hearing was considerably impaired.

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23. SEXTON treats fully of the result of boxing the ears when too frequently practised. The symptoms are shock, pain,

deafness, autophonia, dulness, and the characteristic whistling when rupture of the membr. tympani has taken place. The rupture may be single or multiple. The prognosis is favorable in most cases. He considers of diagnostic importance the sign that ruptures of the *Mt* caused by blows are usually in the membrana vibrans, whilst those produced by traction are in the membrana flaccida. As regards treatment, he recommends the "*laissez faire*," but in some cases insufflation of boracic acid and calendula. The medico-legal aspect of the injury is also considered.

SWAN M. BURNETT.

24. A full and elaborate paper by UECKERMANN on the statistics, etiology, and treatment of the deaf-mutes of Norway considered from a medical standpoint.

VICTOR BREMER.

24 a. From CZERNY's clinic, from 1877 to the end of 1884. The paper reports 112 cases of carcinoma of the skin, and 19 cases of carcinoma of the mucous membranes of the facial region. Of the ear, five cases were observed, and in all these the external ear alone was involved, but no carcinoma of the mucous membrane. All five cases were operated upon. Two were completely cured without relapse; one died of a relapse, one from a doubtful cause, and one was still alive at the time but suffering from a relapse. The implicated part of the parotid was removed in two cases; the trunk of the facial nerve was cut through in one case—subsequent suture of the nerve. In one case a portion of the affected mastoid process was removed. For further details see the original.

Moos.

24 b. This paper embraces all cases of injuries to the head observed in CZERNY's clinic from the years 1877 to 1884 inclusive: 90 injuries of the soft parts, 23 open fractures of the foramen of the skull, 12 fractures of the base, 8 with brain symptoms without lesion of the skull. "The most frequent disturbances after basal fractures are disturbances of the hearing and vision; their prognosis is favorable only when the former are produced by rupture of the *Mt* without concussion of the labyrinth or without subsequent suppuration." "In all fractures of the base strict antisepsis should be maintained by frequent syringing of the nose and the ears, and by plugging the same with disinfectants."

Moos.

#### b.—INSTRUMENTS AND METHODS OF EXAMINATION.

25. HARTMANN, ARTHUR, Berlin. Instruments for examination and treatment of aural and nasal diseases. *Illus. Monatsschr. f. ärztl. Polytechnik*, 1887, Nos. 7 and 8.

26. GOMPERZ, B., Vienna. A new apparatus for steaming with liquor ammoniæ. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 11.

27. MACKENZIE, G. HUNTER, Edinburgh. Reversible nasal saw. *The Lancet*, December 24, 1887.

28. CONETOUX and HAMON DU FOUGERAY. Nouveau procédé d'assèchement du conduit auditif externe par l'air sec et chaud. *Ann. des malad. de l'oreille*, etc., 1887, p. 317.

29. Prof. VOLTOLINI, Breslau. On electrolytic (needle) operations. *Deutsche. med. Wochenschr.*, 1887, No. 27.

25. HARTMANN gives an illustrated description of the instruments used by him in the treatment of aural and nasal diseases: aural and nasal forceps, furuncle knife, ear syringe, and nasopharyngeal curette; the latter differs from Lange's ring-knife in being shaped like the naso-pharyngeal cavity, since the upper cutting portion corresponds in length to the roof of the cavity, so that the adenoid vegetations may be removed with a single application. The spring for the nasal plug is passed through a catheter instead of Bellocque's canula. The nasal canula for irrigation of the maxillary antrum is like the tympanic canula. Hartmann's palate hook, which has already been described, with its attachment to the patient, has been modified in such a manner that the movable sheath, the end of which rests in the anterior nares, is fixed with a spring instead of a screw. The caustic holder for chromic acid consists of a small furrowed silver plate. The conchotome, used for the removal of the anterior end of the middle turbinated body, consists of two cutting rings, which can be opened and closed like those in Matthieu's forceps.

26. GOMPERZ changed Kerr's inhaler, modified by Politzer and illustrated in his text-book, in that the common balloon used for the air-douche can be placed and filled upon the tube which leaves the bottle. The vapors of ammonia are thereby driven into the tympanic cavity under a much higher pressure than with the double balloon.

27. HUNTER MACKENZIE's saw<sup>1</sup> removes nasal exostoses and ecchondroses. The blade can be adjusted by a screw in such a manner as to enable the surgeon to saw in any direction.

28. HAMON DU FOUGERAY was induced by Dr. CONETOUX to devise an apparatus for drying the auditory meatus by dry and warm air. This result is achieved by conducting air into the

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<sup>1</sup> This is a modification of the so-called Bosworth's saw.—M. T.

meatus by means of the balloon, through a heated metal ball and through a bottle filled with calcium chloride.

29. Since the application of galvano-cautery to fibrous and fibro-sarcomatous naso-pharyngeal tumors does not exclude considerable bleeding, VOLTOLINI uses electrolysis. He describes the instruments employed: first, parallel needles; then forceps, the current passing through the ends of their catching blades; third, the electrolytic cutting loop. The platinum loop is here interrupted by an ivory button.

#### C.—EXTERNAL EAR.

30. HESSLER. Otitis by infection. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 39. Cp. Report of the 60th meeting of German naturalists and physicians, vol. xxiii., p. 58, of the *Zeitschr. f. Ohrenh.*

31. Prof. LUCÆ, Berlin. Complete cure of a case of primary carcinoma of the organ of hearing. *Therap. Monatsh.*, November, 1887.

32. Prof. A. POLITZER, Vienna. De l'eczéma de l'oreille. *Ann. des malad. de l'oreille*, etc., 1887, p. 361.

33. STONE. Ivory exostosis removed from external auditory meatus. *Liverpool Med.-Chir. Fourn.*

34. GARRIGON-DÉSARÈNES. Des tumeurs osseuses du conduit auditif externe et de leur ablation; observations. *Bull. et mém. de la société franç. d'otol.*, vol. v., p. 37.

35. GURANOWSKI, Varsaw. Photoxyline solution as a means of closing persistent perforations of the membrana tympani. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 10.

31. LUCÆ's patient was a man of 31, with a tumor in the external meatus of three months' standing. Examination revealed, besides very offensive discharges, a polypoid and slightly reddish tumor, which filled up the entire meatus and was attached to the anterior and posterior walls of the meatus. Recovery took place after injections of aq. chlor. and inflations of equal parts of pulv. herb. sabin. and alum. ust. The diagnosis of carcinoma was based on the microscopical examinations of pieces of tissue removed at an early stage. The structure was that of an epithelioma with numerous, concentrically lamellated horn pearls. Numerous nests of large concentric epithelial cells were found in the stroma of the subcutaneous connective tissue, and could be traced into the base. Therefore Lucæ thinks himself justified



in considering the tumor heteroplastic—that is, of malignant formation.

32. POLITZER describes the different forms of eczema according to development, course, prognosis, and treatment. Regarding the latter, Politzer recommends the exclusion of fluids in acute eczema, and the application of soft ointments in their stead. Moist regions should be covered with calomel powder. Ichthyol, applied in different forms, proved very efficacious. Crusts must be softened with oil or Burow's fluid, and subsequently ointments applied. Of these, eight are mentioned as preferred. Crusts forming again are not removed, but moistened twice a day with balsam Peruv., until they fall off. In cases of squamous eczema, alcoholic solutions of tar, carbolic or boracic acid, in persistent cases with thickening of the epidermis, salicylic soap ointment or dressings with Burow's solution and subsequent application of ointment should be used. Politzer has found concentrated solution of nitrate of silver the best remedy for the treatment of squamous eczema of the external auditory meatus, after treatment with the ointment of white precipitate or with unguent. ol. cadini. The internal treatment of eczema is of no value.

33. STONE operated upon an ivory exostosis which filled the external meatus of a patient thirty-four years old. A thin probe showed that the tumor had developed from the upper-posterior and lower wall of the meatus, not being attached to the anterior wall. After repeated strokes of the chisel at different portions where the tumor was attached, the removal of the whole mass with the forceps was accomplished. Recovery took place without trouble, and was accompanied by steadily increasing hearing power. The removed piece was 13 mm long, 10 mm wide, and 7 mm thick. The chisel was employed in place of the drill, because Stone considers the operation with the chisel less dangerous, and deems it possible to remove the tumor at one sitting.

34. GARRIGON-DÉSARÈNES reports two cases of exostosis associated with inflammation of the external and middle ear. In the third case the tumor preceded the otorrhœa. These tumors also were removed with the chisel.

35. The author uses a ten-per-cent. solution of photoxyline (gun-cotton,—*Reviewer*) to close persistent perforations of the membrana tympani. After syringing the ear with solutions of boracic acid and drying, the solution is applied to the margins of the

perforation with the hair-brush, and renewed after drying, until the closure is complete. The closing membrane is very firm, and resists inflations of air and pressure of the probe. In five cases the method was successfully employed. In three cases the hearing was considerably improved, and in two cases the subjective noises stopped. The ear is permanently protected against the relapse of suppuration. GURANOWSKI gives, in No. 12 of the *Monatsschr. f. Ohrenheilk.*, etc., a supplementary explanation of the ten-per-cent. solution of photoxyline by giving the exact formula for its preparation as follows: Photoxyline, 1 part; æther sulfur., 18 parts; alcohol absol., 3 parts; evaporate the whole mixture to 10 per cent.

d.—MIDDLE EAR.

36. HEIMANN, TH., Warsaw. Otitis catarrhalis acuta duplex; encephalomeningitis; death. *Monatsschr. f. Ohrenheilk.*, etc., No. 9, 1887.

37. BARTH, A., Berlin. Impeded nasal respiration and suppurative otitis media. Lecture delivered to the Berl. med. Gesellsch., December 7, 1887. *Berl. klin. Wochenschr.*, No. 2, 1888.

38. CARDONE, FRANCESCO, Naples. A very interesting case of otitis tuberculosa. *Monatsschr. f. Ohrenheilk.*, etc., No. 8, 1887.

39. KESSEL, J., Jena. The treatment of chronic purulent otitis media. *Correspondenzbl. d. allgem. aerztl. Vereins in Thüringen*, No. 9, 1887.

40. ERSKINE, JAMES, Glasgow. The treatment of chronic purulent inflammation of the middle ear. *Provincial Med. Journ.*, June, July, 1887.

41. PINS, EMIL, Vienna. Contribution to the etiology of affections of the middle ear in children. *Jahrb. f. Kinderheilk.*, vol. xxvi.

42. AYSAGUER, P., Paris. De l'acide lactique dans les supurations de l'oreille. *Bull. et mém. de la soc. française d'otol.*, etc., vol. v., p. 33.

43. PURJESZ, IGNATZ, Budapest. The application of iodol in suppurative otitis media. *Pester med.-chir. Presse*, No. 39, 1887.

44. THORNER, MAX, Cincinnati. Salol; with a report on

the use of salol in affections of the throat, ear, and eye. *Cincinnati Clinical Lancet*, December 10, 1887.

45. KRETSCHMANN, FR., Magdeburg. Fistular openings at the upper pole of the membrana tympani above the short process of the malleus; their pathogenesis and treatment. *Arch. f. Ohrenheilk.*, vol. xxv., p. 165.

46. BARATOUX and DUBOUSQUET-LABORDERIE. Greffe animale avec de la peau de grenouille dans les pertes de substance certannée et mucqueuse. *Progrès méd.*, 1887.

47. HESSLER. Affections of the mastoid process in children. *Arch. f. Ohrenheilk.*, vol. xxvi., p. 46. Cp. Report of the 60th meeting of German naturalists at Wiesbaden, vol. xviii., p. 60, of these ARCHIVES (German edition).

48. BARACZ, Lemberg. A case of trephining of the mastoid process of the petrous bone with injury to the transverse sinus; cure. *Gaz. lekarska*, No. 30, 1887.

49. GRAY, J. P. (Halifax Infirmary). Purulent discharge from the ear, followed by diffuse suppurative meningitis; death; necropsy. *The Lancet*, August 13, 1887.

50. BETTMANN, BOERNE. A case of purulent inflammation of the ear with brain complications. *Amer. Journ. Med. Assoc.*, January 1, 1887.

51. WEIR, ROBERT F. On the surgical treatment of brain supuration following ear disease. *Med. Record*, April 9, 1887.

52. BUCK, ALBERT H. Chronic catarrhal inflammation of the middle ear. *Med. Record*, January 1, 1887.

53. SEISS, R. W. A new method of treating chronic aural catarrh. *Med. News*, Feb. 5, 1887.

54. RICHEV, S. O. A contribution to the management of general atrophy (sclerosis) of the conducting apparatus of the ear. *Am. Journ. Med. Sciences*, April, 1887.

55. BISHOP, S. S. Novel methods of treating diseases of the middle ear. *Journ. Amer. Med. Assoc.*, January 15, 1887.

56. POMEROY. Cases exhibiting the results of multiple paracentesis of the drum-membrane on hearing in chronic aural catarrh. *N. Y. Med. Journ.*, Feb. 12, 1887.

57. BARATOUX, J. On some changes in the middle ear in hereditary syphilis. *Progrès méd.*, October 29, 1887.

58. BOUCHERON. Epilepsie d'origine auriculaire. *Académie des sciences*, Nov. 14, 1887.

59. MIOT, C. Des pressions centripètes et centrifuges sur la membrane du tympan employées comme moyen de diagnostic et de traitement. *Revue mens. de laryngol., d'otol.*, No. 7, 1887.

60. SCHMIEGELOW, E., Copenhagen. De l'aliénation, des mouvements forcés et autres névroses réflexes occasionnées par les maladies de l'oreille moyenne. *Revue mens. de laryngol., d'otol.*, etc.

36. HEIMANN reports a case of acute otitis media with fatal result. The patient was first seized with a violent naso-pharyngeal catarrh, associated with temporary stinging earache and hardness of hearing. Vertigo, headache, and chills appeared after a warm bath. General debility, vomiting, constipation. Examination revealed redness and bulging of both drum-membranes. The following day, spontaneous perforation, muco-serous discharge. Headaches continued whilst patient had no other complaint. After two days: sudden, violent pain of the entire head, vertigo, vomiting, chills, collapsed features, narrow pupils, sensorium but little affected. The tongue cannot be protruded when requested. Upper extremities semi-flexed; later, clonic convulsions and symptoms of paralysis. Death on the following day. The final symptoms were not observed (!) by the author. No autopsy.

37. BARTH'S experience with patients led him to believe that eventually obstruction of nasal respiration may cause an acute or chronic suppurative otitis media. Two cases are related, which seem to confirm this opinion. A case of suppuration of many years' duration was removed by restoration of free respiration in a nose previously obstructed. In order to prevent obstruction of the nose resulting in inflammations of the middle ear by galvano-caustic procedures, Barth recommends thorough treatment of the turbinated bodies with the galvano-cautery, and, if necessary, the removal of polypoid hypertrophies with the galvano-caustic loop. He recommends inflations of 5 to 10-per-cent. cocaine powders in diffuse swelling of the nasal mucous membrane.

38. CARDONE'S patient, 18 years of age, with hereditary taint, was seized with suppurative inflammation of the middle ear without precursory symptoms, with considerable destruction of the drum-membranes, the mucous membrane of the promontory exhibiting gray nodules in places. The treatment was unsuccessful. No tubercle bacilli could be found in the secretions. Death from tuberculosis of the lungs.

39. KESSEL, in the preface to his paper gives an excellent ac-

count of the etiology of chronic suppurative otitis media resulting from acute inflammation, in which he attributes an important part to the micro-organisms concerned. Kessel does not deem it justifiable to make use of the theory of "a cold" for the development of inflammations of the middle ear, since the inspired air of the naso-pharynx has a temperature of over  $30^{\circ}$  C. He points to the frequent occurrence of caries of the ossicles in otorrhœa, most frequently in connection with perforation of Shrapnell's membrane. The principal duty of the physician consists in preventing the acute inflammation from becoming chronic. The author recommends timely paracentesis after previous cocainization. The after-treatment consists in the air douche, after previous cleansing of the nose with  $\frac{1}{2}$ -per-cent. solution of common salt, and in filling up the external meatus with  $\frac{1}{2}$ -per-cent. solution of carbolic acid. In chronic suppurations, especially with the formations of granulations, Kessel recommends the application of sublimated alcohol (0.1 : 100.0 spiritus dilutus). If a cure is not established in this way, we must suppose that granulations or infectious masses exist in the upper portion of the tympanic cavity, or that caries of the ossicles exists. In these cases he excises the malleus. After the subsidence of discharges, he applies solid nitrate of silver to produce a change in the epithelial boundary region—namely, to replace the ciliated cylindrical epithelium by epidermoidal pavement-epithelium.

40. ERSKINE goes fully into the customary method of treating chronic suppurative otitis media. He advocates vigorously the necessity of treatment as opposed to the opinion still prevailing among the laity and also among physicians, of the danger of stopping an otorrhœa.

41. Besides the well-known causes of otitis media in childhood, PINS points out the entrance of water into the external meatus in bathing, as very frequently leading to inflammation of the drum-membrane. An additional cause in children is the difficulty of keeping the nose clean—the inability of many children to remove secretions from the nose. Pins furthermore attributes an important part to the lobular pneumonia or the capillary bronchitis in the development of inflammations of the middle ear in childhood.

42. AYSAGUER recommends lactic acid for cauterization of the the tympanic cavity and the external meatus, both for suppuration and for granulations. He instilled fifty-per-cent. solutions; he has, however, successfully employed the lactic acid in the pure



form. After the application of the latter, the ear should not be syringed, as is done after the application of other astringents.

43. PURJESZ inflated powdered iodol in eighteen cases of acute and chronic inflammations of the middle ear. The drug does not produce any pain in spite of its slight irritant action and is well borne. Suppuration ceased both in acute and in chronic inflammations, in a comparatively short time.

44. THORNER reports the experience of others and of himself in the use of salol in diseases of the eye, ear, and throat. In four cases of acute pharyngitis he had good results from 0.5 to 0.75 grms taken internally three times a day. Its action in tonsillitis follicularis was slower. In two cases of otalgia nervosa the pain disappeared after the third dose of 0.5 salol.

45. KRETSCHMANN gives a full and elaborate description of suppurative inflammation of the middle ear associated with perforation of Shrapnell's membrane. In the anatomical introduction there is a careful description of the space in which the processes leading to perforation of Shrapnell's membrane are supposed to take place. Kretschmann names this space the "malleo-incudo-squamous" cavity. Besides the osseous parts, the boundary is formed *in the median line* by a fold of the mucous membrane, which extends from the head of the malleus to the body of the incus towards the tegmen tympani, *downwards* by a membrane, which is situated between the wall of the squamous portion, and between the process and body of the incus and the neck of the malleus, and which, beginning laterally from behind, attaches to the articulation of the process of the incus with the posterior wall of the tympanum (?). In suppurations of long standing in this cavity, caries of the Rivinian segment develops. In two cases the perforation outside of Shrapnell's membrane could be observed in the external meatus. Caries of the malleus first affects the point above the crista of the neck of the malleus. The incus is first attacked on the lateral side of the body. An isolated inflammation of the cavity has not been observed by Kretschmann, the inflammation being always associated with that of the tympanic cavity. In thirty-three cases there were eight perforations of the drum-membrane where Shrapnell's membrane was involved. In thirty cases a formation of cholesteatoma was found ten times in the limited space. Kretschmann recommends, for treatment of the cases in which a communication exists with the tympanic cavity, copious irrigations with pure solutions of common



salt ( $\frac{1}{2}$  per cent). Cure in two cases. In the other cases irrigations with Schwartze's antrum tube were chiefly used (1 to 2-per-cent. solutions of carbolic acid or solutions of sublimate of 1 : 2,000-5,000). Cure in 7 cases. "If, under this treatment, the offensive smell and the subjective disturbances do not abate within a week, the excision of the malleus and, if possible, also of the incus and the removal of the margo tympanicus with subsequent irrigations *per tubam* are indicated. If even then the offensive odor persists, the mastoid process must be opened."

46. BARATOUX and DUBOUSQUET-LABORDERIE tried, like Reverdin, to cure defects in the skin by transplantation of small pieces of frog skin. The pieces became attached in forty-eight hours and lost the pigment on the tenth day. The frog skin is especially fit for this purpose on account of its thinness, the easy attachment, and the lack of hairs and sudoriferous glands. Baratoux used the frog skin in an analogous manner to Berthold's application of the membrane of the egg-shell for closing perforations of the membrana tympani and for exulcerations in ozæna.

47. After a brief description of the investigations made by Hartmann, Bezold, and Politzer concerning the position of the transverse sinus and the structure of the mastoid process, the author describes the typical method of its opening according to Schwartze, and adds, from the literature accessible to him, an abstract of five cases of trephining the mastoid process complicated with injury of the transverse sinus (Jacoby, Knapp, Owen, Guye, Reck). His own case was a man, 62 years of age, with a fistula behind the right auricle. The probe strikes against a denuded piece of bone. An otological examination was not made. The mastoid was opened on account of the headaches and sleeplessness of the patient. In spite of all precautions, after the chisel had penetrated to the depth of 1 cm, there gushed out a pulsating stream of dark blood. The wound was plugged with carbolized cotton and iodoformed gauze, and dressed with a compress bandage. The course of the disease remained afebrile; the plugs were changed after three days, exhibiting at the lower margin of the wound a gray pulsating spot (the wall of the transversæ sinus). After a week the wound was filled with granulations; the gray spot ceased pulsating. The patient recovered completely. The author points out that, in those cases in which the transverse sinus does not take an abnormal course, the fault lies with the instrument applied. Guye, for instance, used a perforatorium,

Owen a trocar and a grooved needle, and Knapp a flat chisel. The author uses the hollow chisel exclusively. If the transverse sinus is injured, plugging and compression with absorbent cotton are the best measures. If the operation has not been finished on account of the hemorrhage, trephining may again be cautiously tried. Strict antisepsis is required. In the author's case the mastoid process was diploëtic, and the sinus was situated quite superficially.

SREBERNY, Varsau.

48. GRAY reports a patient, twenty-six years of age, with an offensive otorrhœa, which had existed ten years. A week previous to his admission into the hospital pain set in behind the diseased ear. When first seen profuse discharge and a polypus at the bottom of the meatus were found. Complete facial paralysis. Four days after admission intense fever; patient becomes apathetic and answers in a confused manner. On the following day he was in a half-comatose condition. Paralysis and anæsthesia of the left leg. Delirium. Trephining of the mastoid process without finding pus. The next day complete coma. Complete hemiplegia and hemianæsthesia. Death a week after admission. The autopsy revealed the whole right cerebral hemisphere and base covered with offensive pus. Eight ounces could be collected. Upon the posterior surface of the petrous bone a small perforation in the dura mater. In the roof of the tympanic cavity an opening leading into the cavity. Between dura and petrous bone an abscess cavity, the contents of which were supposed to have been emptied through the dura into the cranial cavity.

49. The peculiarities of BETTMANN's cases were, that the inflammation of the ear was acute and that it had been treated for several days with an almost constant application of hot water. All unpleasant symptoms were immediately relieved by applying ice-bags to the mastoid process, no other treatment being introduced.

SWAN M. BURNETT.

50. WEIR's patient was a woman, thirty-nine years of age, who had acquired an injury of the thumb, followed by suppuration, and shortly after by a suppurative otitis media with complications from the brain. The mastoid process was opened with the drill and chisel and some pus discharged. The symptoms improved. The brain symptoms then became worse. An exploratory incision was made through the opening of the mastoid, but no pus was found. Matters were growing worse; on account of the development of an optic neuritis, the skull was trephined over the line of

the left Rolando fissure and an exploratory puncture was made. The patient died on the following day; an autopsy was not permitted.

SWAN M. BURNETT.

58. BUCK believes that the catarrhal inflammation of the middle ear is due in most cases to the same condition in the nasopharyngeal cavity, and that a treatment directed to these parts alone is of more value in the greater part of the cases, than a treatment of the ear itself. As regards the cause of these pharyngeal disturbances, he considers as the most important: smoking, the American mania for fresh air in the sleeping-rooms, and a gouty tendency. If the process is advanced to sclerosis of the mucous membranes, it is incurable. He prefers for the local treatment of the pharynx solutions of nitrate of silver, applied with a cotton plug. He uses for the purpose of removing cheesy masses collected in the cavities of the nose a spray of Listerine (1:4 water). The gouty condition should, of course, be treated in a suitable manner.

SWAN M. BURNETT.

52. SEISS' new method consists in irrigating the mouth of the Eustachian tube by means of a catheter, perforated at the beak on both sides, with drugs which are brought into the catheter with a syringe.

SWAN M. BURNETT.

53. RICHEY gives in this paper further details on the treatment of cases of dry catarrh, according to the method which he had explained in vol. xv., p. 17 of these ARCHIVES. For the employment of vapors of iodine in the tympanic cavity through Eustachian tube he uses a constant air-current, which is produced by the hydraulic automatic air-pump, as used for the production of air-pressure in beer-barrels. He deems this apparatus, which can be easily attached to the water-pipes in the houses, to be very convenient and efficacious.

SWAN M. BURNETT.

54. BISHOP's novel methods are perhaps already in use with many aurists. The first method consists in sucking out the tympanic cavity and in removing its fluid contents by reversing Valsalva's experiment. The second method tends to reach the same result by introduction of a catheter and by suction with a syringe. The third method, which the *Reviewer* has employed for many years, consists, in cases of loss or absence of the membrana tympani, in filling up the external meatus with the desired fluid, then sucking the air with the reversed Valsalva's experiment, whereupon the fluid flows down the throat through the Eustachian tube.

SWAN M. BURNETT.

55. POMEROY reports twenty-four cases of chronic otitis media, which were treated with multiple punctures of the membrana tympani. In eleven cases a decided improvement of hearing in both ears took place, and in three cases a considerable increase in one ear. He deems the operation justifiable, and without danger.

SWAN M. BURNETT.

56. BARATOUX enumerates altogether forty-three cases, nineteen of which occurred in still-born children. Among these were eight with affections of the middle ear, three with those of the labyrinth, and eight with diseases of the middle and inner ears. Of twenty-four which had been living, nineteen had otitis media, one interna, and four interna and media combined. There existed, as a rule, a purulent otitis media, which had extended to the cochlea and the semicircular canals, and there had produced extensive changes. If the inner ear only was involved, hemorrhages in the turns of the cochlea, Reissner's membrane, etc., had taken place, which are explained by the friability of the vessels changed by syphilis.

57. *Epilepsie d'origine auriculaire* is, according to the author, a symptom of swelling of the tube caused by otitis media. A careful examination of the ear should therefore always be made in epileptics.

58. From his experiments on the action of different pressures MIOT draws the following conclusions :

1. Slight pressure upon the drum-membrane of normally hearing persons produces a slight effect upon the stapedo-vestibular joint. Medium and strong pressure cause subjective symptoms, as tinnitus, hardness of hearing, etc. These symptoms appear after pressure of different strength according to the sensitiveness of the persons experimented upon.

2. Slight pressure has no effect upon the stapedo-vestibular joint in patients with sclerosis of the middle ear. In order to produce an effect, the pressure must be the stronger, the more the function of the joint is lessened. The application of medium and strong pressure for the diagnosis of pathological changes of this articulation is the only means of determining whether this is more or less ankylosed. If used at different intervals, it might in a certain number of cases exert a beneficial influence upon the pathological condition, which, if left to itself, would become worse.

59. SCHMIEGELOW discusses the reflex neurosis occurring in diseases of the middle ear. Urbantschitsch's investigations on

the relations of the sense of vision were repeated by him experimentally, but could not be confirmed. The author mentions the neuralgias of the fifth nerve in inflammations of the middle ear, the reciprocal action of both ears, the effects upon the perception of taste and smell, and the reflex impulses transferred to the motory apparatus. In a case of formation of a polypus with impeded efflux of secretions, there existed attacks of anxiety, neuralgia, and vertigo. Cure after the removal of the polypus. According to the experiments, Schmiegelow considers the forced movements and the attacks of vertigo, in opposition to Baginsky's and Lucæ's views, as reflex neuroses, originating from the vestibular branches of the auditory nerve. The impulse is caused by pressure on the labyrinth. Schmiegelow's second case serves as a proof that marked psychosis can be cured by the removal of an aural polypus.

#### c.—NERVOUS APPARATUS.

60. Prof. Dr. LUCÆ. Diseases of the labyrinth. Eulenburg's "Real-Encyclopädie."

61. PERRON. Surdit  d'origine quinique; observation. *Revue mens. de laryngol., d'otol., etc.*, 1887, No. 11.

62. M NI RE, E. Surdit s bilat rales et unilat rales compl tes   la suite des oreillons. *Bull. et m m. de la soci t  fran aise d'otol. et de laryngol.*, vol. v., 1, p. 24.

63. BUCK, ALBERT H. A case of rapid and almost total loss of hearing in a child seven years of age. *Amer. Otol. Soc.*, July 19, 1887.

64. POOLEY, THOMAS. Double optic neuritis and M ni re's disease. *New York Med. Journ.*, January 8, 1887.

60. LUC  gives in this paper a brief but quite complete representation of our knowledge and experience on diseases of the labyrinth. As regards their diagnosis, the physical examination is of especial importance. If the examination with notes of different pitch results in partial deafness, so that the highest notes, which the normal ear readily perceives are heard faintly or not at all even through the entirely free external meatus, we may assume, with tolerable certainty, the existence of a disease of the labyrinth. He emphasizes particularly the importance of Rinn 's experiment for diagnosis. Therapeutically the use of iodide of potash and sweating with pilocarpine are recommended.



The author has repeatedly attained beneficial results with the latter remedy.

61. PERRON reports the history of an anæmic and malarial patient in whom quinine produced tinnitus and vertigo. Acute attacks of deafness of hearing occurred later, which gradually became permanent. The air-douche had no effect. The examination of the drum-membrane admits the assumption of a hyperæmic sclerosis. On the side where the hyperæmia was more pronounced the labyrinth was more severely affected.

62. MÉNIÈRE adds to his former observations four new cases of deafness in parotitis. In two cases only one side was affected, in the two others both sides. In the first case deafness appeared on the eighth, in the second on the ninth day of the disease. In the third case violent headaches occurred on the third day of the disease, followed on the fourth day by bilateral deafness. In the fourth case the bilateral complete deafness was noticed on the fifth day of the disease. In this, as in the first two cases, no other symptom than deafness was observed.

63. BUCK speaks of a child, seven years of age, which became hard of hearing after croup. The deafness rapidly became so intense that speaking could no longer be understood. In spite of the application of Politzer's method, the hearing power was not improved. The drum-membranes appeared somewhat dull and sunken in. In both external meatuses circumscribed swellings occurred, so that Wilde's incision was made, but without relief. It was found that both parents had been syphilitic before the birth of the child. Treatment with iodide of potash, continued for a long time, restored the hearing power almost completely.

64. POOLEY'S case was a blacksmith, forty-three years old, who had for some time presented various indefinite symptoms on the part of the nervous system, the eyes, and ears. He had a typical attack of Ménière's disease, and remained completely deaf and dizzy until his death. Pooley found bilateral neuro-retinitis with all signs of retinitis albuminurica, although the most careful and repeated examination of the urine did not reveal either casts or albumen. The autopsy showed, however, that both kidneys were hyperæmic, and that one was larger than the other. The brain was extremely soft. No tumor nor extravasation were found. Pooley is inclined to accept albuminuria as the cause of the trouble, in spite of the lack of the usual appearances which establish the diagnosis.



## f.—NOSE AND NASO-PHARYNX.

65. WEHMER, RICHARD. On nasal diseases associated with coryza, with special reference to their treatment. *Deutsche Medicinal-Zeitung*, 1887, Nos. 61-63.

66. ROTHHOLZ, Stettin. On the relations of diseases of the eye to affections of the nose. *Deutsche med. Wochenschr.*, 1887, No. 52.

67. HARTMANN, ARTHUR, Berlin. On croup of the nasal mucous membrane; rhinitis fibrinosa. *Deutsche med. Wochenschr.*, 1887, No. 29.

68. MÖLDENHAUER, W., Leipzig. On croupous inflammation of the nasal mucous membrane. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 9.

69. REIERSEN, A. C., Copenhagen. Om Behandlingen of Naesediphtheritis. *Ugeskrift for Laeger*, vol. xiv., No. 33.

70. TSAKYROGLOUS, M., Smyrna. Two cases of nasal polypi (polypus of the septum and reflex neurosis). *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 10.

71. GUYE, Amsterdam. On aprosexia (from *προσέχειν τὸν νοῦν*)—the inability to direct one's attention to a certain subject, as a consequence of nasal disturbances. *Deutsche med. Wochenschr.*, 1887, No. 43.

72. SCHECH, PH., Munich. On asthma. *Münchener med. Wochenschr.*, 1887, No. 41.

73. JOAL, Mont-Dore. Le vertige nasal. *Revue mens. de laryngol., d'otol.*, etc., 1887, No. 7.

74. MOURE, E. J. Sur un cas de chancre induré de la fosse nasale droite. *Revue mens. de laryngol., d'otol.*, etc., 1887, No. 1.

75. JAKOWSKI and MATLAKOWSKI, Varsaw. On rhinoscleroma. *Gaz. lekarska*, 1887, No. 46 ff.

76. ZIEM, Danzig. On operations in the posterior part of the nose under the guidance of the finger. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 8.

77. KILLIAN, J., Worms. Contribution to the study of empyema of Highmore's antrum. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 10.

78. VERCHÈRE. Des indications opératoires dans certaines tumeurs récidivantes de la cavité et de l'arrière cavité des fosses nasales. *Arch. de laryngol., de rhinol.*, etc., vol. i., No. 1.

79. BARATOUX, J. Des végétations adénoïdes.

80. UECKERMANN, V. Adenoid vegetations. *Mag. for Laeger*, 1887, No. 11.

81. CARTAZ, A. De la persistance de troubles phonétiques après l'ablation des végétations adénoïdes. *Arch. de laryngol.*, etc., 1887, No. 2.

82. SREBERNY, Varsau. Cyst of the roof of the naso-pharynx *Medycyna*, 1887, Nos. 50, 51.

83. LUBLINSKI, W. Concretion of the tonsil. *Monatsschr. f. Ohrenheilk.*, etc., 1887, No. 10.

84. LUBLINSKI, W. Polypus of the tonsil. *Ibid.*

65. According to WEHMER the following nasal diseases are associated with coryza: simple inflammations, specific affections, new formations in the widest meaning of the term, and diseases of the accessory cavities. In the acute coryza cocaine is of good service "even for cutting short the affection." Wehmer considers the galvano-cautery as the most important means of removing hypertrophies of the mucous membrane. He finds Gottstein's treatment of ozæna with cotton plugs excellent. For opening of Highmore's antrum he prefers Mikulicz's operation.

66. ROTHHOLZ relates in his paper his experience on the dependence of inflammations of the eye upon nasal affections. Children with scrofulous inflammations of the eye suffer almost without exception from coryza. In unilateral inflammation of the eye the nose is frequently affected on one side only. Relapses of inflammations of the eye frequently follow in scrofulous children a fresh rhinitis. The author considers the cure of inflammations of the eye after a suitable treatment of the nose, which has been constantly observed by him, as a convincing argument for the dependence of the eye disease upon the nose. Ozæna is frequently associated with chronic conjunctivitis. Corneal wounds show in patients with ozæna a tendency to become purulent. [? K.] Nasal affections connected with diseases of the lachrymal ducts must be treated. Rothholz's treatment of scrofulous rhinitis consists in irrigations of weak solutions of common salt by means of a small rubber-ball to be applied four times a day; furthermore in insufflations of nitrate of silver 1.0, magnes. ust. 10.0-20.0. Moist eczema is treated with borvaseline, the dry form with ol. cadini 1.0: vaseline 10.0.

67. HARTMANN relates his experience in non-specific croup-

ous inflammation of the nasal mucous membrane. That this affection has until now been overlooked, he explains as due to the fact, that unless the nasal cavities are carefully examined, the process is considered as a simple acute coryza. The affection consists in the formation of fibrinous exudation on the mucous membrane, to which it loosely adheres, regenerating after removal. The nose is soon considerably obstructed. The croupous membranes can be loosened with the probe and removed with the forceps. In one case the whole membrane filling up the entire nose could be removed *in toto*. The six cases observed by Hartmann were children from three to nine years of age. The disease presents at the outset the picture of an acute coryza with fever. The secretions produce redness and excoriations at the nasal entrance. Cure after one to two weeks. The treatment consists in removal of the membranes and insufflation of powdered iodoform.

68. MOLDENHAUER confirms Hartmann's observations on account of four personal observations, and adds the result of the microscopical examination of one of the removed membranes. "Their appearance does not differ from those regularly found in typical diphtheria." As regards the treatment, Moldenhauer does not recommend the removal of the membranes and the employment of iodoform. He suggests "frequent spraying of the membrane with a warm disinfectant solution, as recommended by Oertel for the treatment of pharyngeal diphtheria."

69. REIERSEN proposes the application of bougies with cocaine, chlorat. and acid. boric. for the treatment of nasal diphtheria. Each bougie (easily fusible) contains from 5 to 15 milligram. cocaine, chlorat. and about 65 centigram. to 1 gramme acid. boric.

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70. TSAKYROGLOUS removed with the knife a tumor with a broad base, situated upon the nasal septum. Subsequent cauterization. This second communication treats of a case of asthma, which was cured by the removal of nasal polypi.

72. SCHECH arrives at the following conclusions :

1. The origin of asthma is frequently found in the nose.
2. It is urgently demanded to examine the nose in every case of asthma or of emphysema associated with asthma.
3. Asthma is in adult life more frequently the cause than the consequence of emphysema, which becomes permanent by the repeated asthmatic attacks.

4. Asthma following nasal diseases does not differ in any respect from that produced by other organs.

5. The beneficial influence of the topical treatment of the nose upon the asthma is evident in a number of cases.

73. JOAL points out that certain attacks of vertigo might originate in permanent or transient affections of the nasal cavities, as has been emphasized by Michel, Hack, Neisser, Hering, and Genaro. These affections are congestions of the nasal mucous membrane, as acute coryza, catarrh of hypertrophic mucous membranes, and nasal polypi. This is observed especially in nervous individuals, in which, at the same time, mouches volantes, megrim, nausea, asthma, nervous debility, fainting, and paleness of the face appeared.

74. MOURE relates the observation of a primary hard chancre on the right side of the nasal septum. The external surface of the nose considerably reddened and swollen. Three days later, *i. e.*, two months after the first appearance of the nasal affection, there appeared a specific papular exanthema extending over the entire body. Cure through antisyphilitic treatment.

75. To an elaborate review of the history, anatomy, and clinical aspect of rhinoscleroma, JAKOWSKI adds his bacteriological examinations and inoculation experiments. The results correspond to those of Paltauf and Eiselsberg. But the pure cultures differ in some respect: of thirteen mice, inoculated with the bacilli into the pleural cavity, none acquired pneumonia. He discusses, furthermore, the relation between rhinoscleroma and Stoerk's blennorrhœa, and the connection between the chorditis vocalis inferior hypertrophica and the two processes mentioned above. Finally he describes two cases from MATLAKOWSKI's surgical department. They were women of forty and thirty-two years of age respectively, from Russian Poland. SREBERNY.

76. ZIEM gives a brief note on the ablation of the posterior ends of hypertrophied turbinated bodies with the galvano-caustic snare under the guidance of the finger introduced into the nasopharynx. If the operation does not succeed, we may operate under the guidance of the rhinoscopic mirror or remove the entire turbinated bone, as has been suggested by Schwartz. (*Reviewer* cannot forbear criticising Ziem's method as too complicated. In more than sixty cases, operated by him during the previous year, the swelling could always be removed with the cold snare through the nose. No dangerous bleeding occurred in any case.)

77. KILLIAN states, in an interesting paper, his experience and observations of empyema of the antrum of Highmore. We here give his conclusions concerning the treatment. The author prefers to select the suitable treatment for each individual case, rather than to adopt a certain method for all cases. The following indications determine his therapeutic measures :

1. Remnants of roots and carious teeth, which cannot be filled, should be extracted, and the alveolar defects probed. If a communication exists with the antrum, or if it is made by a slight pressure of the probe, the irrigation should be made through it.

2. If this is not the case, the condition of the natural entrances should be examined ; if they permit a safe entrance into the antrum, we should use them for the introduction of the irrigation canula ; if not feasible, we should then proceed, according to Mikulicz, from the inferior nasal meatus.

3. If no alveolar defects exist, and the carious tooth is accessible to conservative treatment, the tooth should be filled after careful disinfection of its cavity, and proceed as in No. 2.

4. In case of suppuration without caries of the tooth, the same course must be followed.

78. VERCHÈRE divides the nasal tumors into benign (non-recurring) and malignant (recurring) ones. The first can be removed by the natural paths through the anterior and posterior nares. Is a preparatory operation required, the tumor can be removed either at one sitting, with the incision kept closed or open in order to watch the relapse, or the tumor can be gradually destroyed through the opening. In his first case he describes a naso-pharyngeal polypus. After the cutting through the soft and hard palate, the tumor was destroyed with the thermo-cautery in the course of several months. There remained pieces of tumor as well as the cleft in the palate. The second case was a round-cell sarcoma. In spite of the repeated opening of the nose from the outside, and the removal of the tumor with sharp spoons, relapses occurred.

79. BARATOUX gives a description of adenoid vegetations without adding any thing new. He recommends for their removal a forceps, without mentioning that many others have recommended it long before.

80. UECKERMANN gives for the practitioner a brief review on the nature and treatment of adenoid vegetations.

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81. CARTAZ points out the continuation of phonetic disturbances after removal of adenoid vegetations, consisting in speech with a nasal twang. Cartaz believes that the long-continued pressure of adenoid vegetations on the soft palate produces a sort of a muscular paresis or disturbance of accommodation, upon which the disturbance of speech depends.

82. SREBERNY's patient is a young anæmic nervous girl, with a cyst of the bursa pharyngea, which caused a distressing, dry, and convulsive cough. Both lower turbinated bodies were also hypertrophied. Since the cauterization of one swelling did not improve her condition, she protested against the cauterization of the other. After the subsequent opening of the cyst with the galvano-cautery and the discharge of viscid secretion, the cough ceased, but returned after several days with renewed vehemence. This was due to the development of a catarrh of the bursa pharyngea in the place of the cyst. Cauterization with arg. nitr., continued for weeks, finally completed the cure. The author lays great stress upon the general treatment. The cyst is, according to Sreberny, dependent upon the nasal catarrh, and not conversely, as Tornwaldt believes.

83. LUBLINSKI describes a concretion in the tonsil, which was of considerable size. It was  $2\frac{1}{2}$  cm long,  $\frac{1}{2}$ — $\frac{3}{4}$  cm wide, and  $\frac{1}{2}$  cm in thickness. There existed an unpleasant sensation of pressure during the act of swallowing.

84. The same author describes a polypus, which originated from the lower portion of the left tonsil, rested upon the base of the tongue, and almost touched the opposite tonsil. Removal with scissors. It was 3.2 cm long, and 3-5 mm wide.



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